OLYMPUS

User Manual

analySIS

Imaging Solutions for Light Microscopy

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Step by Step analySIS

Installing analySIS

Background information

Welcome to analySIS!

The software package you have chosen is by Olympus Soft Imaging Solutions. You have thus entered into the worldwide analySIS-user community. Welcome. The broad range of functions for digital image acquisition, image processing, analysis, database archival and results documentation are all at your disposal in analySIS.

We think you'll find working with analySIS a tremendously satisfying experience!

analySIS configuration

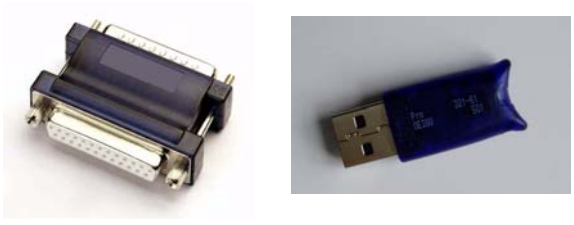
analySIS is available in many various expansion versions and configurations. This means that some functions described in this "Step by Step" introductory manual, or in other documentation may not be included in the software package you have chosen - or vice versa - some functions that are included in your package may not be described below.

www.olympus-sis.com

Stop on by our website. It is chock full of information including: our ever-growing range of products, how to contact our customer service hotline, all about our upcoming workshops and seminars - and much much more.

Software protection

The software is protected by a dongle. It is standard practice that a USB dongle, which is to be installed on one of your PC's USB ports, comes with the computer. For PCs that don't have a USB port, an LPT dongle is available on request.



The software is protected by a dongle. On the left you can see the LPT dongle for the parallel port on the right, the standard USB dongle.

- analySIS can neither be installed nor started without the dongle.
- The dongles are differently colored, depending on which type they are:

USB-Dongle	LPT-Dongle	Meaning
blue	white	unlimited single license
black	not available	limited time dongle which only unlocks the software for a limited amount of time.
red	red	network dongle

- A network dongle can be connected to any of the computers of the network. Please keep in mind that before analySIS can be installed, the driver software for the network dongle has to be installed first. The Setup menu includes an option for installing the driver software for the network dongle.

Related topics
Installing the network dongle 8

Step-by-step

Warning **Install the image analysis program before connecting the camera with the FireWire slot. This sequence is necessary to avoid having the operating system install the wrong camera driver. The camera drivers which are required for the operation of the cameras are installed together with the software.**

Warning The installation of the hardware is described in the corresponding installation manual. The notes on hardware installation in this chapter apply solely to Olympus Soft Imaging Solutions' FireWire cameras.

Installing the analySIS software

1) Turn on your PC and, if necessary, start up the operating system.
2) Close any and all application programs.
3) Insert the software protection key (dongle) into a USB port of your PC.
   ► The Found New Hardware Wizard dialog box will appear. The operating system will then try to install a driver for the dongle.

As soon as you have inserted the software protection dongle, the Found New Hardware Wizard dialog box will appear.

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

Warning The correct dongle driver can only be installed during the installation of analySIS.

4) Close the Found New Hardware Wizard dialog box by clicking the Cancel button.
   Keep clicking the Cancel button until the dialog box disappears.
5) Place the analySIS installation CD into the CD-ROM drive.
   ► The setup program will start automatically - unless you have deactivated the autorun function. If so, start the setup.exe file manually via Windows Explorer.

When you insert the installation CD the setup menu will come up automatically.

6) Select the analySIS FIVE option in the setup menu to install or update this software.

7) An installation wizard guides you through the entire software installation. Simply follow the onscreen instructions and select the relevant entries.

Update/Reinstall

- Should you already have analySIS installed, Setup offers you an update of the installation. You should select this option to keep important program settings. These settings include the calibration data, for example.

Precalibrated input channels

- When working with a light microscope, the input channel can be precalibrated. This can, however, only be done with certain camera types such as the FireWire cameras from Olympus Soft Imaging Solutions, for example.

Hardware installation

- analySIS supports different types of microscopes, stages and cameras. Select your hardware during installation so that the correct drivers are installed.

► After successful installation, a program file with the links to the installed components is opened.

8) You may now connect your FireWire camera to your computer.

9) Doubleclick the program symbol to start the software.

- The icon to start analySIS can be dragged and dropped onto your desktop while you press the [Ctrl] key. You can then conveniently open analySIS with one doubleclick.

10) Doubleclick on the "Read Me" icon for the latest information on analySIS.

Related topics
Precalibrated inputs 37

Installing the network dongle

These step-by-step instructions are only relevant when you use a network dongle.
In these instructions, "Server" stands for the computer on which the network dongle and the license manager have been installed.
"Client" stands for all computers which are part of the network and which must be connected to the server in order to install and operate an analySIS version.

1) First install the license manager on the server. The license manager is required for the operation of the network dongle.
2) Plug in the dongle on the computer which is to be the server and start the setup program from the analySIS CD.
3) Select the Network software protection key option in the setup menu.
4) In the Installation type dialog box select the Service option.
   - ► The license manager is installed after a few standard questions have been answered.
   - ► The installation of the dongle has then been completed. You don't have to install an analySIS version on the server.
   - ► You don't need to copy the license manager onto any client PC.

To enable analySIS to locate the license manager more quickly

To make a quick and reliable access to the license manager possible, you should copy the "nethasp.ini" file onto every single client PC. The "nethasp.ini" file uses the server's IP address. How you find out this IP address, and how you use the "nethasp.ini" file will be described in the following.

Display the server's IP address

To find out the server's IP address, when using the Windows operating system, do the following.

1) Click the Windows Start button on the PC into which you've inserted the network dongle and installed the license manager on.
2) Select the Run... command.
3) Enter "Command" and confirm with OK.
4) Enter the command "ipconfig" in the command window and confirm with the [Enter] key.
   - ► The IP address belonging to this computer will be shown in the command window.
5) Copy the IP address you've found to your Windows clipboard.

Inserting the "nethasp.ini" file

1) Select the Explore this CD option in the analySIS setup menu.
   You will find the "nethasp.ini" text file in the \program\HASP\Network\ Help directory.
2) Make a backup copy of this file. Open the copy you've created.
3) Replace the entry "127.0.0.1" in this file with the contents of your Windows clipboard.
4) Save the modified file under the name "nethasp.ini".
   - ► In the modified "nethasp.ini" file, the IP address you found for your server will then appear on the "NH_SERVER_ADDR=" line.
5) Copy the modified "nethasp.ini" file to the Windows directory (c:\winnt or c:\windows) of all of the PCs that have been installed in the network, on which analySIS versions run.
   - ► By employing this adapted "nethasp.ini" file, you make the search for the license manager in the complete network much easier. Starting analySIS on every single client PC will take place more quickly.

Installing analySIS on the server

Is analySIS to run on the PC on which the license manager has also been installed, the following step will have to additionally be taken.

Copy the unmodified "nethasp.ini" file to the server's (c:\winnt or c:\windows) Windows directory. (You will find the "nethasp.ini" file in the \program\HASP\Network\ Help directory.

- ► With the help of the "nethasp.ini" file, analySIS can then also be installed on the PC into which the network dongle has been inserted. In this file, the "127.0.0.1" entry is a reference to the PC itself.

Installing PDF documentation

1) Select the Documentation option in the setup menu to have PDF documentation files copied onto your PC's hard drive in full or in part.

2) Simply follow the onscreen instructions and select the documentation desired.
   - ► A program icon that looks like a book will appear within the program folder selected. This is a link to the documentation files that were just installed.
3) Select the Quit option to exit the setup menu.
   - To start up analySIS and/or the documentation you had installed, simply doubleclick on the corresponding icon(s).
   - Via the setup menu you can copy/delete additional parts of the documentation to/from your hard disk.

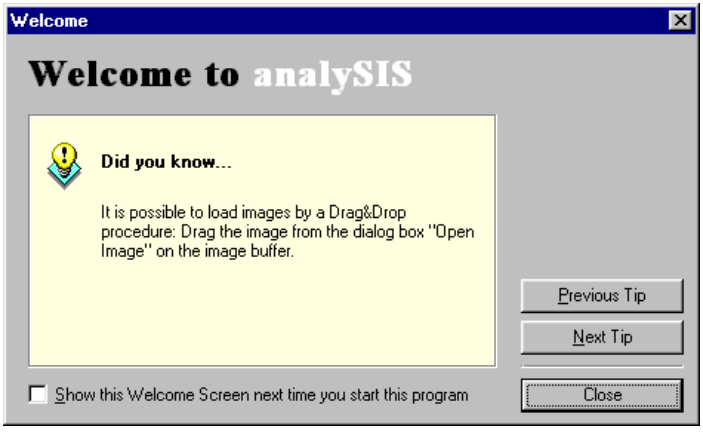
Any questions or problems?

Background information

Other documentation

All documentation is also available as PDF files on the analySIS installation CD. To select the files you wish to have copied onto your hard drive, go to the setup menu. These files can be viewed onscreen and printed out using Acrobat Reader by Adobe (comes with analySIS).
Depending on the scope of your order, you will also have been supplied with other manuals, as well as these step-by-step instructions.

See more tips by using the ? > Welcome... command .


Welcome
Welcome to analySIS
Did you know...
It is possible to load images by a Drag&Drop procedure: Drag the image from the dialog box "Open Image" on the image buffer.
Previous Tip
Next Tip
Show this Welcome Screen next time you start this program
Close

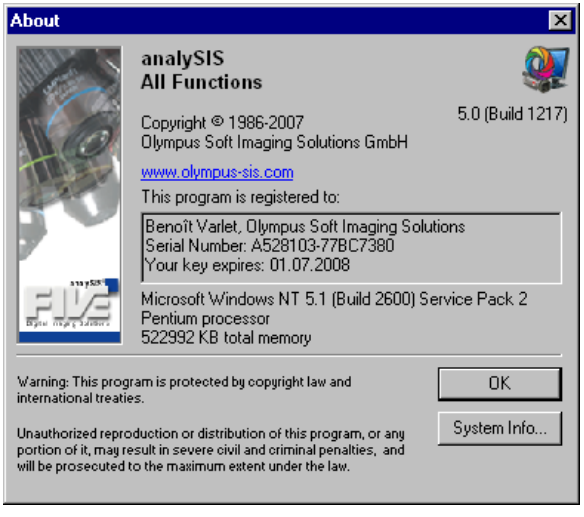
Step-by-step

We want to hear from *you*.

If you have any questions or any problems you're having difficulty solving on your own - even after consulting the relevant documentation - then contact our customer service, preferably by e-mail. Our customer-service representatives will be more than happy to assist you.

1) Start your image analysis program.
2) Try and specify when and under what exact conditions the problem you're having occurs.
   - Ideally, you should try and be able to reproduce the problem/error. This facilitates our customer service finding the source of the problem, and thus, a solution.
3) Make an exact note of any possible onscreen error messages involved.
   - Or simply make a "screenshot" of the message(s). All you need to do to get a snapshot of the active window is to press [Alt+Print]. This copies the active window to the Windows clipboard. Then you can easily include the copied window in an e-mail, by pressing [Ctrl+V].
   - Oversized e-mails can lead to transmission difficulties. It is thus not advisable to copy 'screenshots' of an entire onscreen view into an e-mail.
4) With the ? > About... command, open the About dialog box.
   - ► The About dialog box tells you what expansion version you have, the build number and the serial number of your version, as well as the operating system being used.
   - Please be sure and have all this information available when you contact our customer service.

You can have the most important software data displayed by using the ? > About... command.


About
analySIS
All Functions
5.0 (Build 1217)
Copyright © 1986-2007
Olympus Soft Imaging Solutions GmbH
www.olympus-sis.com
This program is registered to:
Benoît Varlet, Olympus Soft Imaging Solutions
Serial Number: A528103-77BC7380
Your key expires: 01.07.2008
Microsoft Windows NT 5.1 (Build 2600) Service Pack 2
Pentium processor
522992 KB total memory
Warning: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent under the law.
OK
System Info...

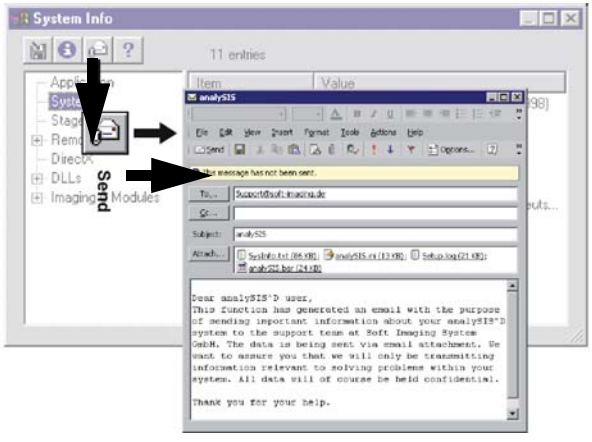
5) Now all you need to do is to write us an e-mail describing the problem you're having as precisely as possible (incl. snapshots if applicable). Include the system information as well. Then send it to us at our customer-service e-mail address.

support.osis@olympus-sis.com

- The easiest, and most convenient, way to contact our customer service, is by using the automatic e-mail generation function.
  The ? > About... > System Info... > Send command will automatically generate an e-mail form, which you can then send to us when you've added the relevant details of the problem you're experiencing. Before sending it off to us, please read the notes in the e-mail window, concerning the information on your system, which will be sent to us via this e-mail.

  Should you not be able to send an e-mail from your PC, use the ? > About... > System Info... > Save Info command to save the files, so that you can send the e-mail from another PC.
- Please feel free to call us or fax us as well - at the following numbers.
  Tel.: (+ 49) 2 51 / 7 98 00-0
  Fax: (+ 49) 2 51 / 7 98 00-6060

The ? > About... > System Info... > Send command opens the window with the automatically generated e-mail form you use to contact our customer service. All necessary system info is automatically included in this e-mail form. All you need to do is enter a precise description of the question/problem you're having and then just click on Send (upper-left button, e-mail-window button bar) to send it off to us.


System Info
11 entries
Item
Value
Send
analySIS
Dear analySIS*D user,
This function has generated an email with the purpose of sending important information about your analySIS*D system to the support team at Soft Imaging System GmbH. The data is being sent via email attachment. We want to assure you that we will only be transmitting information relevant to solving problems within your system. All data will of course be held confidential.
Thank you for your help.

First Steps

The (GUI) User Interface

Background information

GUI The graphical user interface influences the appearance of a program. It determines which menus there are, how the individual functions can be called up, how and where files, e.g., images, are displayed, and much more. This chapter describes the basic elements of GUI.
Please note: The Graphical User Interface (GUI) in your image analysis program is fully adaptable to meet your own specific requirements.

Menu bar Many commands are accessible via the relevant menus. You can configure the menu bar as needed. Use the Special > Define Menu Bar... command to add, alter or remove menus as you wish.

Image buffer box Each image is allotted its own image buffer within your image analysis program. When you start up your image analysis program all available image buffers will be empty. While using the program they get filled - by loading or acquiring images, and by performing various image operations for altering the image such that a new image results. During any given work session, this means that *many* images are accessible simultaneously. Only *one* image buffer however, may be active at a time.

Active image buffer

- The image in the active image buffer will always be displayed in the image window independent of how many other images are being displayed.
- The active image buffer contains either the live image or an acquired image. Any interactive input or measurements are always applied to the active image buffer.

Button bars Commands you use frequently are linked to a button providing you with quick and easy access to these functions. Please note, that there are many functions which are only accessible via a button bar, e.g., the functions required for editing an image overlay. Use the Special > Edit Button Bars... command to make button bars look and include what you want them to.

Viewport manager The viewport manager enables you to determine how images are displayed in the image window. Your are provided with many ways - no matter what the application - for displaying your images optimally onscreen. You can hide the viewport manager to create more room for other windows, for example: To do so, use the [Alt+1] key stroke.

Image manager The image manager contains numerous tabs. Click the different tabs to alter the appearance of the image manager. The first two tabs List and Gallery are reserved for the administration of images.

The operands box is for:

- determining source and destination image buffers used in image processing operations which alter the original image, e.g., inversion.
- linking images for certain image processing operations, e.g., addition of two images.

Use the image buffer box:

- for an overview of the images loaded,
- for rapid access to image information, such as its size and image type,

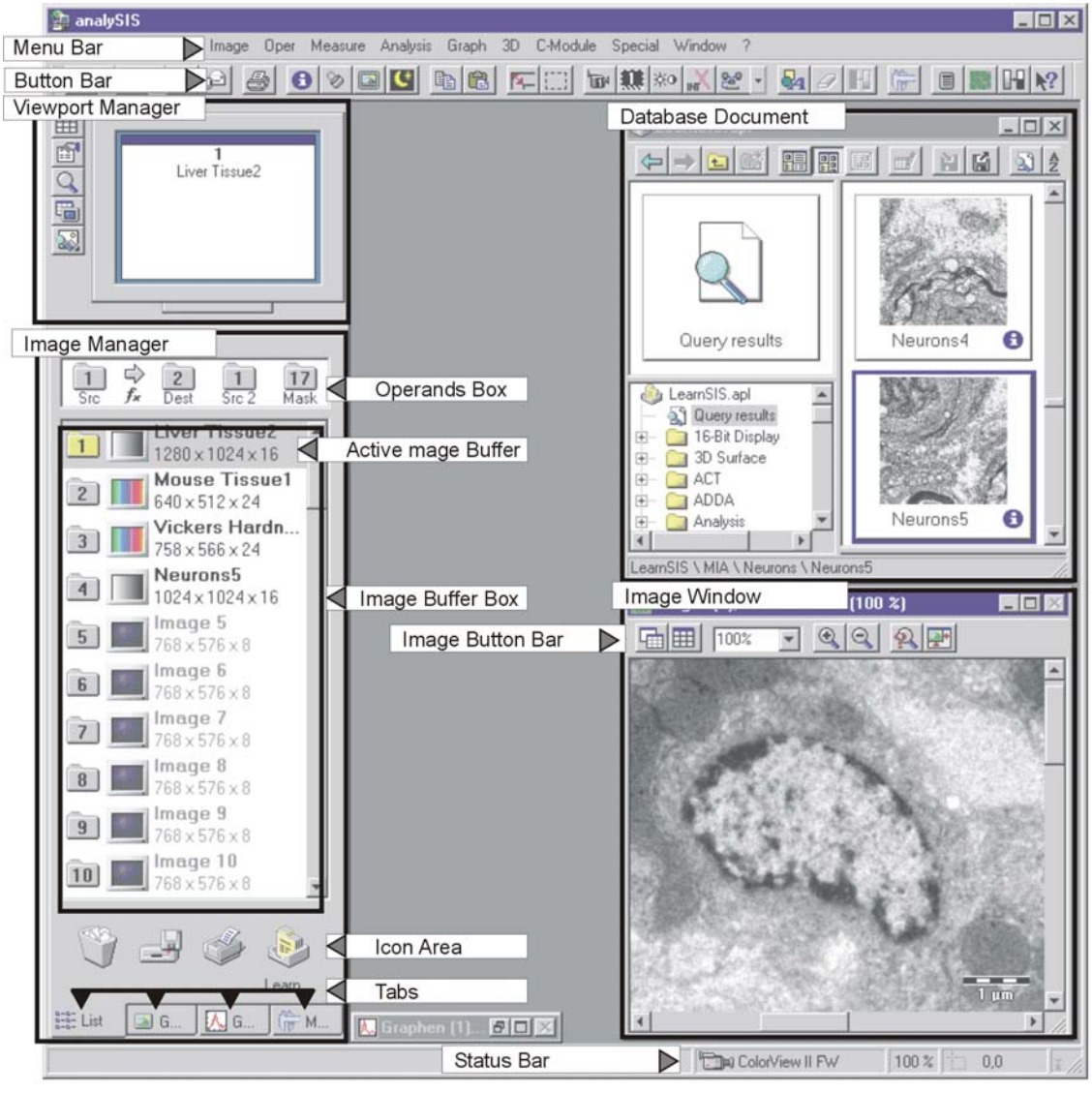
Related topics
Saving GUI configuration 21

- to activate image buffers.

The icon area

- is for printing, archiving or saving images one at a time.

You can hide the image manager to create more room for other windows, for example: To do so, use the [Alt+2] key stroke.



Document Area Documents can only be displayed within this area. Each document is opened within a separate window. Your image analysis program supports the following document types.

Image	Database	Text
Diagram	Sheet	Graph
Report	3D-Workspace	

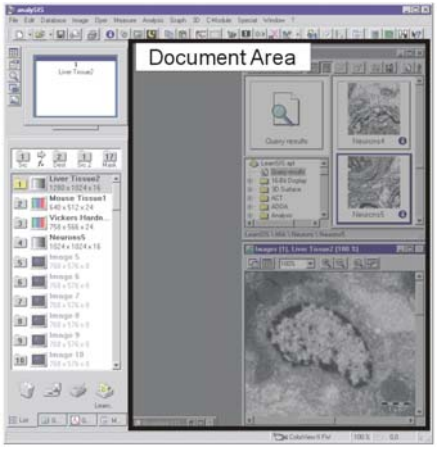


Image window The image window is a special window for viewing either loaded and/or live images. It is possible to view up to 25 images simultaneously. To display them, the image window is divided up into several windows, i.e. viewports. Each viewport can display a single image.
To alter image display within the image window - e.g., zoom factor - use the Image button bar.

Status bar The status bar displays the following and more:

- brief descriptions of all functions. Simply move the pointer over the command or button for this information.
- name of the active input channel,
- position and size of the global frame.

Loading images

Background information

Loading images You can load several images simultaneously. Click the Open button in the Open Image dialog box to load all selected image files. The image files will be loaded into successive image buffers. The first image buffer is the active image buffer.
To select...

- **a continuous group of images:** Leftclick on the first of the images. Then, while pressing [Shift], leftclick on the last one of the images.

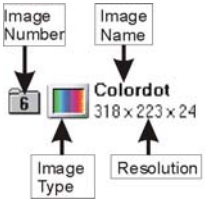
- **a non-continuous group of images:**
  Select the first image by clicking on it with the left mouse button. Keep the [Ctrl] key depressed as you select all image files needed with the left mouse button.
- **all images within a directory:**
  Simply press [Ctrl+ A].

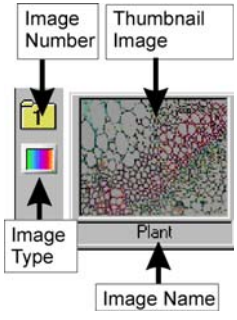
The File > Open... command is context-sensitive. This means the Open Image dialog box only appears if an image window is active. If a text document is active the Open Text dialog box will appear, etc.
The Open button is in the Standard button bar. To have a look at the dropdown list of all the various commands for opening, click the arrow beside this button.

Image-buffer-box icons

After you have loaded an image, it will be displayed in the image manager. Image type, image name and resolution are directly displayed in the image manager. The displayed information are somewhat different depending on whether or not you have set the list or gallery view in the image manager.

A resolution of 318 x 223 x 24 corresponds to a true-color image with a bit depth of 24, width of 318 pixels and a height of 223 pixels. The gallery view shows you thumbnails in the image-buffer box of all images currently loaded (right).





Possible image types are:

Empty image buffer

A gray value image can be comprised of 256 (8 Bit) or 2^{16} (16 Bit) gray values.

A binary image is comprised of 2 gray values - black and white.

A false-color image is an 8-bit gray-value image whose gray-values are shown in color.

A true-color image, or RGB image, is comprised of 2^{24} colors (24-bit).

A Fourier image is a 32-bit image made up of real and imaginary numbers of 16 bits respectively.

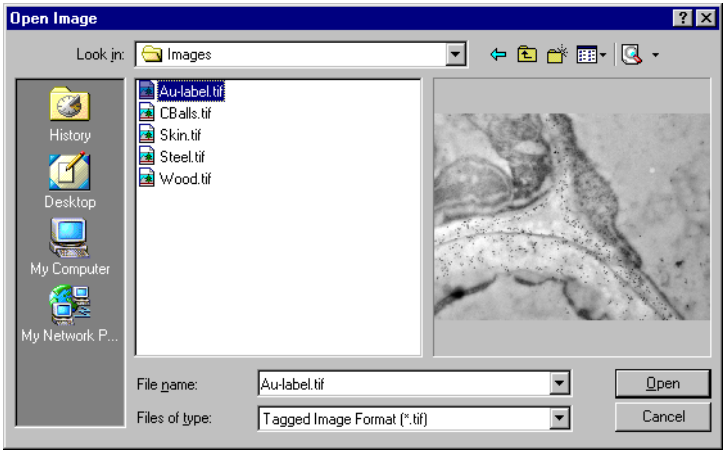
Step-by-step

Loading images stored on the hard drive

1) Click on the image buffer you wish to load the image into with the left mouse button in the Image Manager. Activate - for example - image buffer #5.
   ► The image buffer selected will be color highlighted and assigned to the active viewport.

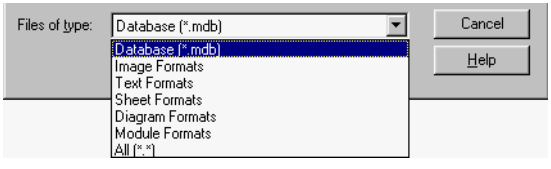
2) Select the File > Open... command to load an image.
   ► The Open Image dialog box will appear.

Dialog boxes for loading files are based on standard MS Windows dialog boxes. The dialog box for loading images also has a preview function.



3) Select Tagged Image Format (*.tif), the standard image format, in the Files of type list.
   • This format is the default when you open this dialog box for the first time.

The Files of type list is in all dialog boxes for loading documents. It provides file formats for all document types.



4) Click the Up One Level button to move up a level in the directory structure of your computer.
   ► In the field below the button bar you will find a list of all sub-folders and documents of the file types selected.

5) Doubleclick on one of the folders listed to get a listing of its contents - i.e., all sub-directories and files the folder contains.
   • The root directory of your program contains the "Images" sub-directory. A selection of TIF images is available here.

6) Click the Preview button to view thumbnails of image files. Select the image files one at a time.

7) Select the images you wish to load.

8) Click the Open button to load the images selected.
   ► The Open Image dialog box will be closed.
   ► The images will be loaded into successive image buffers. The first image will be loaded into the active image buffer, e.g., #5. The next images you load are then put into image buffers 6-9 (if you have loaded altogether 5 images simultaneously).

Activate image window

Sometimes the image window is covered by another window. This is the case if a document window has been maximized or if many other documents are open. The following step by step instruction is only one possibility to bring the image window back to the foreground.

1) Select the Window > Document-Manager... command or use the [Alt+3] key stroke.
   ► You will find all of the open document windows listed in the document manager. The document type and the title of the document window are given for each document.

2) Select the image window.
   ► There is always one image window!

3) Click the Activate button located in the document manager.
   ► The image window is now in the foreground.

Loading images into specific image buffers

1) Click the Gallery tab in the image manager.
2) Activate the image window by simply leftclicking within the window.
   • If the header of the Images window is in color, this means it is active.

3) Select the Standard (button bar) > Open... command.
4) Leftclick on the image file you wish to load.
5) Drag the file directly onto any one of the image buffers while pressing the left mouse button (drag&drop).
   ► The image buffer will show a preview of the image you have loaded.
6) Repeat the last step as often as needed.
7) To quit loading, just click the Close button.

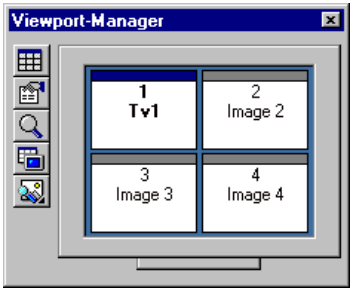
Use the mouse to drag&drop images into the image buffer desired.
MS Explorer, a file manager, can also be used for drag&drop loading.

Displaying multiple images

Background information

Viewport A viewport is a window in the image window where each of the loaded images, or the live image is displayed. You can divide the image window into numerous viewports, thus displaying numerous images simultaneously.

The viewport manager enables you to influence the way images are displayed in the image window.

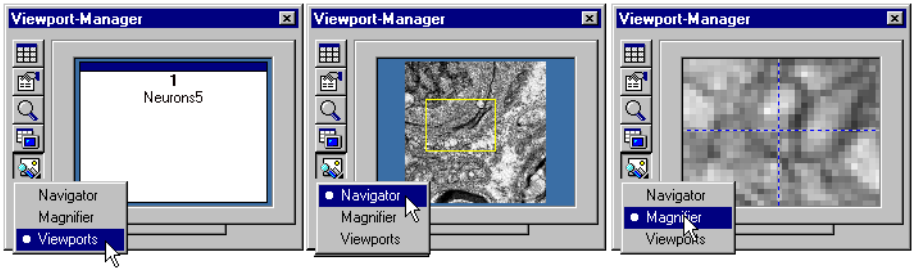


The viewport manager has a separate button bar for setting viewport properties fast.

	Button	Description
	Arrange Viewports	Determines the amount and order of the viewports in the image window.
	Display Properties	Opens the Display Properties dialog box. Enables you, for example, to change the appearance of the viewports and the maximum amount of viewports. You can enter a comment for each image which is then saved together with the image. Use the display properties to show this image comment in the viewport. The Display-Properties > Visualization tab enables you to select a false color view for all loaded gray-value images.
	Zoom	This button enables you to increase or decrease the size of the image in the active viewport by increments of 100%.

	Display Configuration	This button enables you to save all viewport settings. You can also link images with viewport settings which can be loaded together with the viewport settings.
	Select Viewport Manager Pane	You see a schematic monitor in the viewport manager. This button enables you to determine what is to be shown in this monitor. Three views are possible:
View	**Viewports**	The viewport view is the default view. It shows you the current order of the viewports in the image window. In other words, you see the image window in a schematic view. The image names and numbers of the image buffers are shown in the image buffer instead of the images. You will need this view when working with dual screen systems.
	Navigator	The navigator view shows the image in the active image buffer. The image is completely shown in the navigator. You can define the image section which is shown in the image window directly in the overview image located in the navigator. Rightclick in the viewport manager to open the context menu. Select the Show Live command to view the live image in the navigator.
	Magnifier	The magnifier shows a magnified portion of the image in the active image buffer. Move the pointer across the image. The shown section always corresponds to the image section which is directly under the pointer. Rightclick in the viewpoint manager to set the zoom factor of the magnified image.

Select one of the 3 possible views from the viewport manager:



Dual Screen System

This paragraph is only relevant if your system supports two monitors. A dual screen system means that there is an additional monitor which is exclusively used for viewing images. The Windows monitor is the main monitor on which your operating system runs. The second monitor is called the dual monitor. The dual monitor solely contains an additional image window.

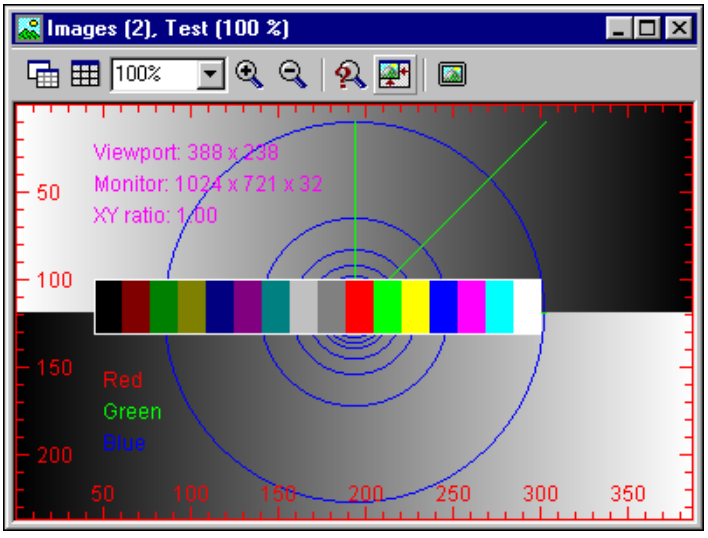
The viewport manager contains a tab for each monitor. Click on the appropriate tab to switch back and forth between the monitors. Use the buttons located in the viewport manager, to influence the appearance of the dual monitor.

Step-by-step

Optimizing display

1) Press [Ctrl+Alt+T] to generate a test image.
   - The image window contains a button bar with which you can quickly alter the appearance of the images in the image window.

Press [Ctrl+Alt+T] to generate a test image. It will have a color image overlay which displays current monitor resolution and other information. Press [Ctrl+Alt+Shift+T] to generate a color test image.
The test image is automatically the same size as the active viewport. The test image will always be displayed at 100% zoom.
The header shows the number of the image's image buffer, (2), the image name, (Test), and the current zoom factor (100%).



2) Click the Arrange Viewports button to re-define the number and arrangement of viewports. Select a 1x2 arrangement.
   - ► The image window will be divided up into two viewports. The test image is in the left viewport. Image buffers will be reassigned. Zoom factors will be set to Auto. Though reduced in size somewhat, the entire test image will be shown.

3) Click the Single View button to display just one image in the image window - the active viewport image.
   - ► The viewport arrangement and what image buffers are shown in which viewports remain unchanged.

4) Select one of the entries of the Zoom Factor dropdown list - or enter any zoom factor desired into the field directly; e.g., 30%.
   - ► The test image will be reduced to 30% zoom. The viewport will no longer be totally taken up by the image. Where the patterned background starts (in the viewport) is where the image stops.

5) Click the Zoom In button to double the current zoom factor.
   - ► The test image will now be displayed at a zoom factor of 60%.

6) Click the Adjust Zoom button to have the zoom factor adjusted to fit current viewport size.
   - • The length/width ratio of the image will not change. Unlike the automatic zoom factor, this zoom factor is not linked to the size of a window - i.e., even when you adjust the size of a window, the zoom factor stays the same.

7) Alter the size of the image window.

8) Click the Adjust Window button to have window size adjusted to fit current image size.

9) Click the Zoom button in the viewport manager.
   - ► You will now see a magnifying glass appear in the active viewport. Use the mouse to move it. As soon as the magnifying glass touches the top border of the viewport, the image will be moved upward.

- Leftclick to raise the zoom factor by 100%, e.g., from 300% to 400%.
  Rightclick to lower the zoom factor by 100%, e.g., from 300% to 200%. The minimum zoom factor is 100%.
  Click the middle mouse button (or press [Esc]) to exit the zoom mode.

10) Click the Select Viewport Manager Pane button located in the viewport manager. Select the Navigator view. Select what image segment you want shown (in the image window) within the thumbnail.

- Move the mouse onto the red-frame border around the thumbnail. The mouse pointer will change shape, turning into a double arrowhead. While pressing the left mouse button you can reduce the frame in size. The length/width ratio of the frame will be the same as the viewport in the image window.

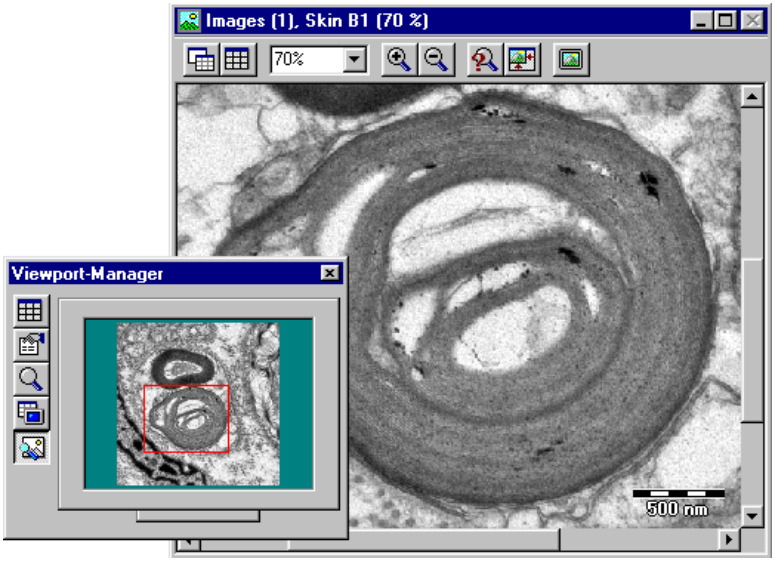
- Now move the mouse to within the red frame. The mouse pointer will now turn into a four-pronged arrowhead. You can move the frame by moving the mouse while pressing the left mouse button.

► The image segment you selected will be shown in the image window.

11) Magnify the images zoom factor, so that only one image section is shown in the image window. Use the slide control located in the image window to move the image section.

► The frame in the navigator moves accordingly and once again shows the current image position.

Within the thumbnail in the viewport manager you can define which image segment is to be displayed within the image window. To define the segment, adjust the size of the frame and move it to where you want it within the Navigator.



Saving GUI configuration

Background information

Workspace You can save your graphical user interface in a file. This is called a workspace. A workspace includes the layout of all document windows and button bars as well as how viewport and image manager are positioned. It can also include specific images and documents you wish to have loaded.

- **Defining GUI layout**
  You may want to define workspaces for each of the various kinds of tasks, thus optimizing how the graphical user interface is laid out for each of these. Separate workspaces could be for image acquisition, report generation and image analysis. Having separate workspaces gets you the onscreen layout you need and fast.
- **Reloading images/documents**
  The path names of currently loaded images and documents can be saved in a workspace. Saving the current GUI in a workspace at the end of your workday makes it totally easy for you to continue where you left off the next morning. Any and all images, sheets, diagrams, database(s), report(s) that were loaded when you saved the workspace will be right where you left them.

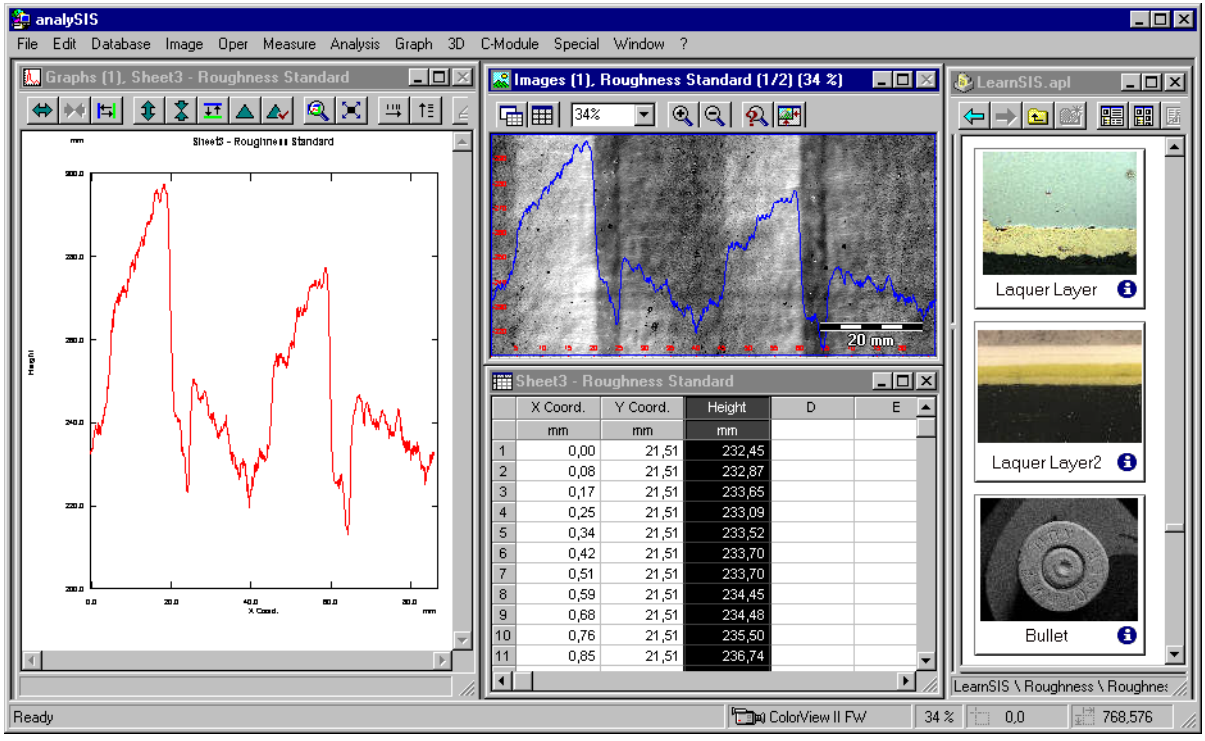
Warning

Be sure to save all your images before shutting down your image analysis program. Any unsaved images will be deleted without prior warning.

Configuration versus Workspace

The Special > Configuration command enables you to individually determine elements on your user interface, as well. Please note that the configuration and workspace contain different elements of the user interface. Configuration refers to what commands have been defined for menus, button bars and keyboard, e.g., user-defined button bars. A configuration saves what functions are available on your GUI. A workspace, however, actually saves what the GUI looks like, including specific documents. The information saved in workspaces and configurations is totally different.

The program interface can greatly differ in appearance. In the example below, the image graphs, sheets and database windows are arranged so that they do not cover each other. This order is optimal when wanting to do intensity profiles or measure histograms. You can save such a layout in a workspace.
Please not that there is a default workspace for working with reports. Use the [Ctrl+2] key stroke to load this workspace.



Step-by-step

Saving GUI layouts as workspaces

1) Open documents of all the types you wish to have included in your graphical user interface (GUI), e.g., an image, a database, a measurement sheet and a diagram. Close all other documents.
   Use the Measure > Histogram... command to quickly create a diagram and sheet in addition to the active image.
   - Press [Alt+1] and [Alt+2] to make both viewport and image manager disappear from view.
2) Arrange the windows optimally to your satisfaction within the GUI.
   - Select the Special > Preferences > View > Allow tiling and cascading of image window check box. Then select the Window > Tile Vertical menu command.
3) Select the File > Workspace > Save as.... command.
   - Enter a name for your workspace into the File name field of the Save Workspace dialog box, e.g., "analysis".
   - Disable the Load documents (not only layout) check box so that only the layout of the GUI is saved, and not any specific documents.
   - Select the Do not save option to ensure this workspace remains unchanged when you close it.
   - Click the Save button.

Loading workspaces

1) Activate the Workspace button bar. This is done by selecting the following check box: Special > Edit Button Bars... > Button bars > Workspace.
   - ► This button bar has 5 buttons which represent 5 workspaces. The first two buttons are already assigned to the predefined workspaces called "normal" and "report". The third button represents the new workspace you have just defined ("analysis").
   - • To make any changes as to what workspaces the buttons represent, simply use the File > Workspace > Define Menu... command.
2) Let's have a look at how a workspace can be used: First, load a different workspace: e.g., the predefined workspace called "normal". Simply click on the button for this workspace (the first one) to load it.

3) Close all documents.
4) Now load your own user-defined workspace ("analysis"). Simply click the third button in the Workspace button bar.
5) Then load an image, your database, a sheet and a histogram. All these documents will be positioned according to your workspace layout.

Creating workspaces to use day-in and day-out

1) Select the File > Workspace > Save as... command. In the dialog box, enter the name of the workspace, e.g., date. Select the Load documents check box. Select the Confirm save on close option. Close the dialog box.
   - ► The fourth button now represents this workspace.
   - • At the end of your workday: save all images you wish to retain. Any images that have not been saved will be deleted without any prior warning and are thus lost for good.
     Close down your image analysis program. Click Yes when a message appears asking you whether or not you wish to save this workspace. All documents that have not been saved will result in similar messages. Save those documents you wish to hang onto.
     The next time you start up all those documents will be loaded automatically as well.

Acquiring images

Your image analysis program supports a wide array of cameras and acquisition devices. The commands for acquisition depend on the acquisition devices or cameras being used. The functionality can therefore diverge considerably from what is described here. Divergences occur between a digital camera or a video camera, for example.

Warning Illustrations and examples in the following chapter are based on the CCD color camera ColorView *IIIu*.

Acquiring images using intX

Background information

intX The abbreviation intX stands for intelligent Exposure. Use this acquisition process to make good acquisitions with functions that are easy to use. The intX acquisition process is only offered for cameras made by Olympus Soft Imaging Solutions.

Image resolution: acquisition and snapshots A considerable advantage of using intX is that you can select different resolutions for the live-image (acquisition) and for the snapshot. A lower image resolution is suggested by default for the live-image since the frame rate is then higher and thus the movements in the live-image are not choppy. If you are writing a snapshot to the image buffer, it is recommended, however, to select the highest camera resolution possible in order to attain the optimal in image quality.

intX enables you to automate the acquisition process to a large extent. The exposure times for live acquisitions and snapshots are optimized independently of one another. The optimization of the exposure time occurs continually and automatically.

Camera calibration Before you can use intX for the first time, your image analysis program has to calibrate the camera. This calibration is solely required to determine your camera's special properties, which are required for the automatic calculation of the exposure times. To carry out this calibration, simply follow the directions your image analysis program gives you.

XY-calibration and intX intX uses the calibration data of the active input channel for the XY-calibration of the images.

intelligent Exposure offers a convenient alternative to the acquisition commands Images > Acquisition and Images > Snapshot. Click the left mouse button to start the live-image. Click the right mouse button to end the live-image and to write the image to the image buffer.

Related topics
Calibrating inputs 37

Step-by-step

Acquire images using intX

This command is not available for all cameras and software configurations.

1) Select the Images > intelligent Exposure... command.
   - ► The intelligent Exposure dialog box is opened. When using this dialog box, you still retain access to all of your image analysis program's other functions.
2) Should this be your first time using intX, you will receive the message that your camera has not yet been calibrated. Follow the directions.

3) Click the Acquisition button to begin the live-acquisition.
   - ► The exposure times calculated by intelligent Exposure are displayed in the dialog box's status bar. The term Live Exp. (Live Exposure Time) stands for the exposure time of the live acquisition, while Snap Exp. (Snapshot Exposure Time) stands for the exposure time of the snapshot. Independent of the calculated exposure time for the snapshot, the exposure time for the live acquisition cannot exceed 125 ms. In this way, a quickly reacting live-image is guaranteed, which simplifies setting the microscope while the camera is running.
4) Bring the image into focus.

   - Before you focus, click the Focus mode button. By doing this you will switch the camera to the highest resolution. One camera pixel is then exactly equal to one pixel on your screen. Then click the Focus mode button once more to return to a view of the complete image.

5) Click the White Balance button to conduct a white balance. In the image window, move the ROI's red rectangle to a white or uniformly gray position on the specimen. Change the size of the ROI by keeping the mouse depressed and moving the mouse. Rightclick to confirm position and size of the ROI.
   - When using a reflected light microscope, you can simply take a white sheet of paper as a sample for the white balance.
     When using a transmitted light microscope, try to find a position on the microscope slide without a sample.
6) The Exposure adjustment slide control enables you to manually influence the exposure time for snapshots as calculated by intelligent Exposure. Move the Exposure adjustment slide control to the right to increase the exposure time, or to the left to shorten it.

7) Click the Snapshot button to acquire a single image.
   - ► intelligent Exposure acquires a snapshot and writes it to the active image buffer. The snapshot acquisition ends the live mode.

Configuring inputs

Background information

Logical input channel

Your image analysis program uses the concept of logical input channels when acquiring images via camera, slowscan-interface, or other acquisition devices. A logical input channel includes all settings relevant to image acquisition. The graphical user interface of a logical input channel is basically the same for physically-different ac-

quisition devices - such as digital cameras or video cameras. The only differences are in the available functions in the Configure Input dialog box and the Camera control.

Usually, the setup program installs the appropriate input channel so that you can start acquiring images immediately after installation. You only then have to configure the input channel when you want to use special camera settings. In the input channel you can, among other things, set the following aquisition parameters:

- the image resolution,
- calibration data,
- live-image display within viewport,
- real time functions such as the live-overlay or an over exposure warning and
- macro commands to be carried out either before or after image acquisition.
  You can, for example, select the microscope magnification before the acquisition or have a scale bar automatically drawn into the image after the acquisition.

Online shading correction

Optical systems consisting of camera and microscope generate image inhomogeneity, or so called shading, even if care was taken with setting up the devices. The shading makes itself noticed by the fact that the image gets darker toward the edge. A shading correction corrects these image flaws with the help of reference images. Using the online shading correction of ColorView *IIIu* these corrections already take place in the live-image.

The online shading correction is activated in the logical input channel. Before the online shading correction is able to be used, you must acquire these reference images. In addition to the camera characteristics, the microscope's optical characteristics, especially the objective being used, contribute to the correction image. A correction image for each camera resolution and objective combination must be made accordingly.

A software wizard will guide you step-by-step through the acquisition of these reference images. This wizard is automatically called up when you acquire the first image with the online shading correction activated.

Step-by-step

Set up a new input

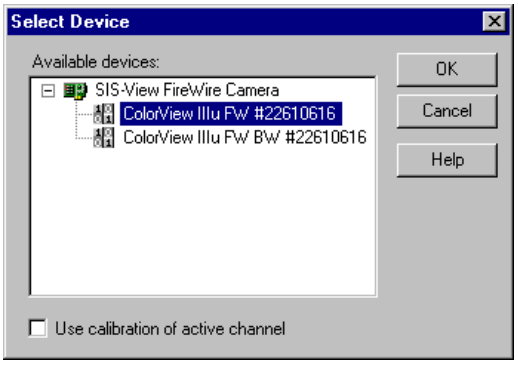
Only set up a new input if no input has been predefined for your camera. Should an input already exist, it is usually better to duplicate the already existing input.

1) Select the Image > Set Input... command.
   ► All current logical input channels are listed in the Set Input dialog box. You may duplicate an existing channel and then modify it, or set up an entirely new input channel.

2) Click the New Channel button.
   ► The Select Device dialog box will be opened.
   You will find predefined inputs for all image signals which can currently be read with your image analysis program.

3) Select the device desired in the Available devices list.
   - To display all inputs available, click on the plus sign (within the tree control directory).

Two different system modes are offered for the ColorView IIIu, Color and Black/White. In order to be able to use the Black/White mode, you must create a new channel.



4) Select, for example, "ColorView IIIu FW #...", if you have installed a CCD-color camera of the ColorView *IIIu* type. The abbreviation "FW" stands for FireWire.
   - Two channels will be automatically set up for ColorView I and ColorView *IIIu*. The channel with the additional "BW" must be used for the camera's black & white mode.
5) Click on OK.
   ► A new logical input will be added to the list of available input channels.

6) Click the Configure Input button to define the properties of this input channel.
7) Close the two dialog boxes by clicking OK.

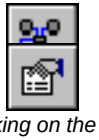
Duplicate already existing input

If you want to configure the input differently, first duplicate one of the already existing inputs. In doing so, you retain all of the channels settings.

1) Select the Image > Set Input... command.
   ► All current logical input channels are listed in the Set Input dialog box.
2) Choose one of the existing inputs, for example the ColorView IIIu FW input, if you have installed a CCD-color camera of the type ColorView *IIIu*.

3) Click the Duplicate channel button.
   ► The selected input channel is copied together with its settings and a new input channel is set up with these settings. The number 1 is added to the name of the input.

Configure inputs



1) Select the Image > Set Input... command. Select an already existing input.
2) Click the Configure Input button to define the properties of this input channel.
   ► The Configure Input dialog box will be opened.

Doubleclicking on the camera icon in the status bar will open up the Configure Input dialog box also.

3) Click on the Info tab to change the name of the input channel.
4) Click on the Input tab to set image acquisition parameters.
   - The functionality of this tab will depend on what kind of camera you are using. This may mean that your Input tab is significantly different to the one described here.

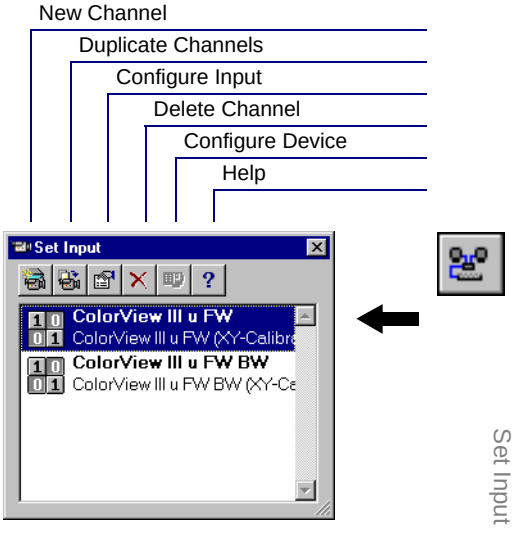
5) You do not have to make an entry in the exposure time field when configuring the input.
   - Exposure time may be interactively adjusted while viewing a live image. To do this, use the Camera Control dialog box (Image > Camera Control... command) during live-image acquisition.
   - The Sharpen filter may be activated/deactivated in this tab as well via the respective check boxes. Or, use the Camera Control dialog box to do the same thing - conveniently - during live-image acquisition. If you are using intX, the settings for the sharpen filter are adopted from the active input.
   - The Camera field shows a description of your camera type. Click the Info... button for more information on the camera, for example the current temperature of the CCD chip and of the camera housing.

6) Select a predefined camera resolution from the Resolution list. The selected resolution influences the spatial resolution of the acquired images.
   - Please note: the larger the spatial resolution, the slower the camera works in live mode, and the longer the exposure times you'll need, will be. Therefore, it can make sense to define two channels with different resolutions. You still use the channel with the smaller resolution mainly for the live mode, whereas the channel with the larger resolution will be used for the snapshot image acquisition.

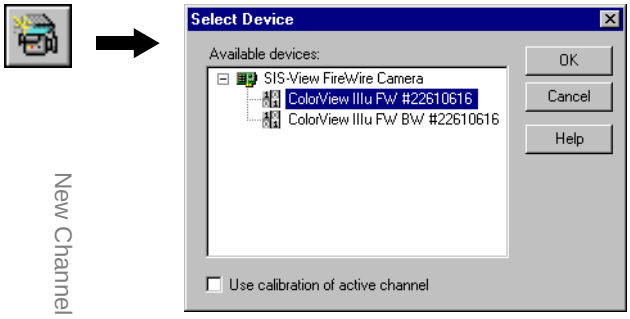
7) Select the Online Shading-Correction > Activate check box to utilize the online shading correction.
   Select the procedure used by you from the Illumination method list.
   - The online shading correction will immediately be used should correction images already exist for the current settings. Should no appropriate correction images be available, your image analysis program will automatically start a software wizard for the acquisition of correction images.

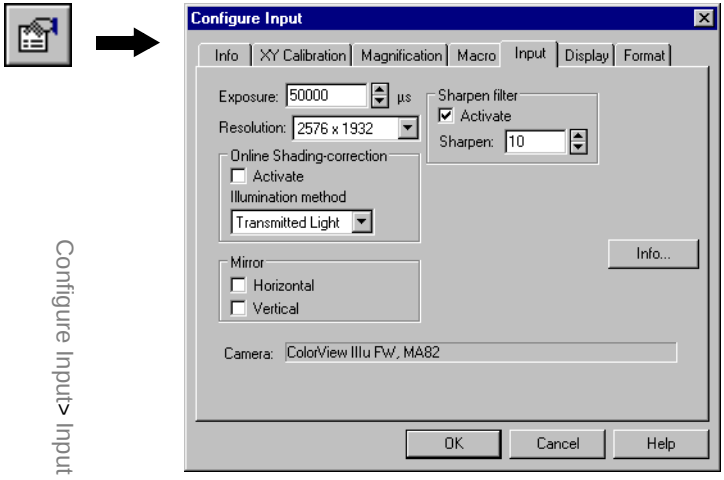
8) Click OK to close the dialog box.

Logical input channel properties will be defined in a single dialog box on several tabs. For every different camera configuration used you may define a separate input channel. Your image analysis program supports up to 100 channels. Scanners and cameras with a TWAIN interface may be operated via these input channels as well.



Set Input





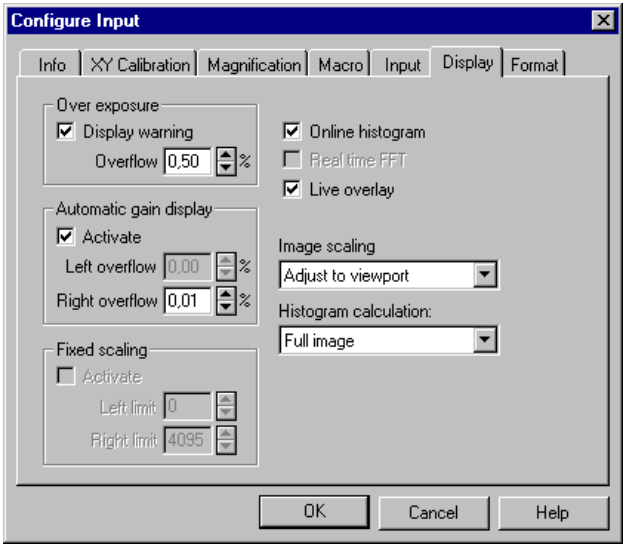
Optimizing display

Background information

Configure Input > Display

The Configure Input > Display tab provides you with a number of possibilities for optimizing the way live-images and snapshots are displayed on your screen. These include:

- having an overexposure warning appear;
- enhanced-contrast onscreen display of images even if acquisition conditions are poor, via automatic or fixed-scale contrast enhancement (Automatic gain display or Fixed scaling),
- checking on current intensity distribution (intensity = mean of all 3 color channels) during image acquisition using the online histogram;
- activating live overlay;
- setting the scaling of an image within its viewport.



Live overlay

If the Live overlay check box has been selected, image overlays are also available to you in the live acquisition mode. This means you may:

- conduct numerous measurements within a live-image as well and have the results written in the overlay;
- have a measurement grid and automatic scale bar shown within the live image;
- during the live acquisition, already highlight and label image details (or more generally, write texts or insert graphics into the overlay).

Please note: The following functions for Olympus Soft Imaging Solutions cameras are available only if the Live-Overlay has been activated: setting the ROI for white balance in the live-image, Partial Readout, and setting the ROI for a sharpness monitor in the live-image.

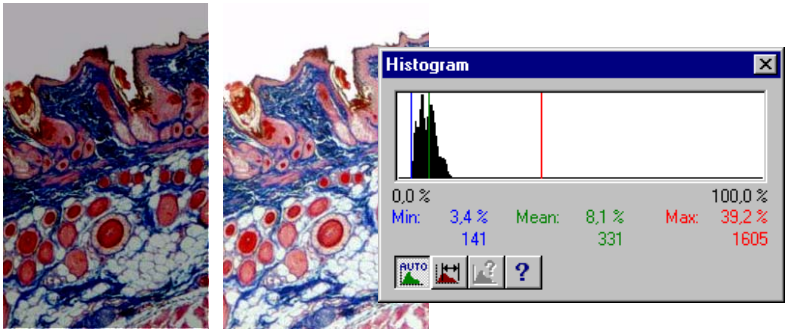
Automatic gain display

Use the automatic gain display to acquire images independent of the illumination parameters. The system analyze the current histogram in real time and spreads the histogram onto the entire dynamic range of the camera.
Even when working with the automatic gain display, you should align the exposure time with the actual illumination parameters. Use the online histogram as a check. The exposure time should be set in such a way, so that the spread of the histogram is as wide as possible, thus filling the entire dynamic range.

Please note: The automatic gain display only slightly improves the image contrasts. Over exposure cannot be corrected by the Automatic Gain DisplayInversely, there is increased noise if the image is very much underexposed.

You cannot use the Automatic Gain Display if you want to compare the intensities of numerous images with one another.

This online histogram shows a narrow distribution. The image would thus be dark and lacking contrast without automatic gain display. When the Automatic Gain Display has been activated, the existing signal range will be spread to improve monitor display. This makes image structures much more clearly visible.



Online histogram

If the Online-Histogram check box has been selected, you can check the intensity distribution during image acquisition. During image acquisition, a window showing the current histogram will appear automatically. This histogram will be continually updated.

The histogram shows you if the image is illuminated properly. The distribution is cut-off to the right if the image is overexposed. If the image is underexposed, the distribution shows a peak at the left.

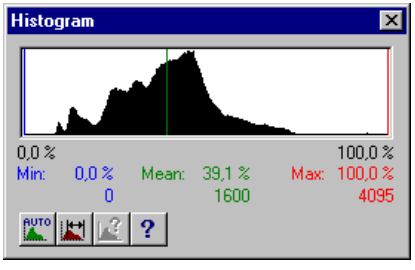
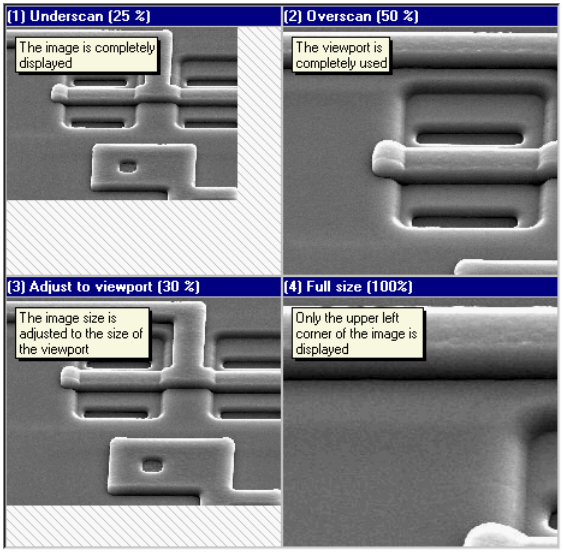


Image scaling

Your image analysis program offers you several possibilities to customize the size of the image to fit the active viewport. The view of the image in the viewport does not have any effect on the actual image resolution.

- Underscan: the system automatically selects from the zoom factors (of 25%, 50%, 100%) the one at which the entire image is displayed within the viewport. This may mean that some viewport space is left over.
- Overscan: the system automatically selects from the zoom factors (of 25%, 50%, 100%) the lowest zoom factor at which the complete viewport is taken up by the image. In certain cases, the image will not be visible in its entirety.
- Adjust to viewport: image size is adjusted to fit the viewport's current size. In some cases, stripes can appear in the live-image display. Should this be the case, use either the Underscan scaling or the Overscan scaling.
- Full size (100%): the live-image will be shown with no zoom factor. If the viewport is smaller than the image, only as much of the image as fits within the viewport will be shown.

Depending on the image scaling selected, the image will appear in different sizes in the viewport.


(1) Underscan (25 %)
The image is completely displayed
(2) Overscan (50 %)
The viewport is completely used
(3) Adjust to viewport (30 %)
The image size is adjusted to the size of the viewport
(4) Full size (100%)
Only the upper left corner of the image is displayed

Step-by-step

Optimize live display

1) Select the Image > Configure Input... command (or click on the Configure Input button in the Set Input dialog box).
2) Select the Display tab.
3) Select the Display warning check box in the Over exposure group.
4) Enter 0.5 into the Overflow field.
   - ► The program will then caution you, "Warning! Over exposure!" as soon as more than 0,5% of the image's pixels are white, during an acquisition.
5) Select the Activate check box in the Automatic gain display group.
   - ► Now the image will always be shown with enhanced contrast onscreen no matter what the actual illumination conditions are. Please note that overexposure and/or over illumination cannot be corrected by the automatic gain display.
6) Enter the value 0.01 in the Right overflow field.
   - ► Now 0.01% of the brightest image pixels will be displayed white onscreen.
   - • Use the right overflow value to prevent pixels which are too bright from interfering with the automatic gain display.
   - • A Left overflow value cannot be defined for the ColorView *IIIu*.
7) Select the Online Histogram check box to check the actual intensity distribution during a live image acquisition and to appropriately adapt the exposure time. (Intensity = mean value of the three color channels).
   - ► The histogram will appear during live image acquisition automatically.
   - ► In addition, the minimum, mean and maximum intensity values of the current image will be shown. The percentages refer to the camera's maximum possible value. For a 12-bit camera this value is 4095; for an 8-bit camera 255.

8) Select the Live overlay check box to be able to write information into the image overlay during live acquisition.
The live overlay is also a necessary requirement for some of the other functions, e.g., partial readout, which you can activate in the camera controls.

9) Select one of four display options in the Image scaling list.

10) Confirm the settings you have made by clicking OK.

Acquiring images

Background information

Live-acquisition mode

In the live-acquisition mode you see the live-image in the active viewport. The requirements for the live acquisition are determined by the active input channel. Use the live-acquisition mode for focusing, illuminating and positioning your specimen under the microscope. While in the live-image mode, only those commands that are relevant in this mode are available to you.

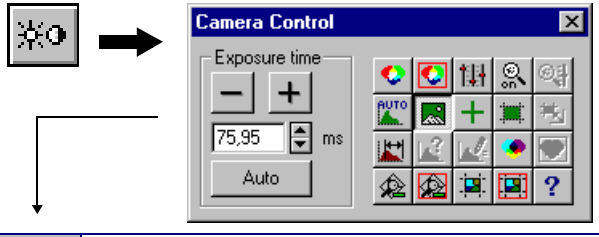
Acquiring snapshots

Selecting the Image > Snapshot command acquires a single image via the active logical input channel and places it in the active image buffer. Use this command to quit the live-acquisition mode as well.
When an image is acquired, additional image information is also saved; e.g., calibration data and current input magnification. Rightclick on an image buffer to access any of this image information via the context-sensitive menu.

Camera control

Camera control gives you quick and easy access to the most important camera settings - and interactively during live acquisition, too.

*The functions available in the Camera Control dialog box will depend on what kind of camera you're using. When using a **ColorView Illu** the dialog box appears as below:*



	Exposure time	determines for what length of time the camera's CCD chip is to be illuminated. -/+ alters the value in pseudologarithmic steps. Auto sets the value after the automatic evaluation of the current histogram during a live-image. Please note: The image area is the basis of the calculation which you also determine for the automatic gain display. When acquiring images with extreme contrasts, you should not use the automatic exposure time. Fluorescence images, for example, are very quickly overexposed when you use it.
	Color settings	opens a dialog box containing slide controls which enable you to correct color errors and with which you can set the gamma values and the color saturation.
	White balance	corrects a tinge - either in the live-image or in the snapshot. Use the button with the red frame to define the image area which is to be used to calculate the white balance.
	Sharpen Filter On/Off	activates / deactivates the sharpness filter, which makes the image sharper or softer, depending on the sharpness filter settings.

	Sharpen Filter Settings	opens the dialog box containing the slide control for the sharpen filter. Maximum values are -30 (soft) and +30 (sharp). The value 0 makes the filter have no effect.
	Use automatic gain display	activates / deactivates the automatic contrast enhancement. Now the image will always be shown with enhanced contrast onscreen no matter what the actual illumination conditions are.
	Histogram-calculation on entire image	All of the pixels are used for calculating the current histogram. This histogram is evaluated for the automatic contrast enhancement. In addition, the histogram determines the automatic exposure time, which you can access by clicking the Auto button located in the camera controls.
	... cross-hairs	Only pixels of a horizontal and vertical line (each one pixel in diameter) located in the center of the image are included in the histogram's calculation.
	... ROI	Only the pixels within a frame set by you (Region Of Interest) are included in the calculation of the current histogram.
	Set ROI	sets a red frame into the image which you position with the mouse and whose size you can increase or decrease by keeping your left mouse button depressed. The right mouse button enables you to set the frame which then becomes invisible.
	Use fixed scaling	activates/deactivates the fixed scaling contrast enhancement. It works with fixed limits, unlike the automatic contrast enhancement which evaluates the currently updated histogram.
	Fixed Scaling ... ... automatic setting	automatically recalculates the fixed limits for the current camera settings.
	... manual setting	opens the dialog box in which you can redefine the fixed limits for the fixed scaling contrast enhancement.
	Black balance	corrects the image background. The program calculates the mean value for each color channel in an area (ROI) which you defined. These values are subtracted from all pixels in the entire image. The black balance is to be used predominately for fluorescence acquisitions in order to balance the undesired background in the acquisition. Please note: Do not use the black balance with brightfield acquisitions. If you did, you would change the colors in the images. Use the button with the red frame to define the image area which is to be used for the black balance.
	Sharpness Monitor On/Off	shows/hides the sharpness monitor. The sharpness monitor consists of a dialog box in which a relative measurement of the sharpness is displayed by a changing bar which can vary between "Blurred" and "Focused". In doing so, the green bar shows the maximum sharpness reached since the live acquisition was started. The black line shows the minimum sharpness reached so far. Use the button with the red frame to define the image area which is to be used for calculating the image sharpness.
	Partial Readout	enables quick live acquisitions. A rectangular part of the image is defined for the partial readout to which the readout is limited during the live acquisition. A higher frame rate is attained due to the smaller amount of data being transferred. The live overlay must be enabled for the partial readout. The live overlay can be enabled via the Display tab located in the Configure Input dialog box. Use the button with the red frame to define the area of the image which is to be read out.

Step-by-step

Determine image buffers and viewport for the image acquisition

1) Click on the image buffer within the image manager you wish to have the camera image placed in.
   - ► The active image buffer will be color highlighted.
   - ► The viewport currently linked to the active image buffer will have a color header both in the image document and in the viewport manager.
2) You wish to display the camera image in another viewport. Simply drag&drop the image buffer (of the camera image) onto the new viewport - within the viewport manager. Then leftclick on this viewport.

Set magnification correctly before acquisition

3) Select the Image > Set Magnification... command to set magnification so that your resulting image is correctly calibrated.
   - • This is only necessary if magnification is not automatically read out via the microscope's remote control.
   - ► The Magnification list includes all those magnifications that you saved in the magnification table (Image > Configure Input... > XY Calibration > Save...).
4) Click on the magnification currently set on your microscope and then click on OK.
   - • You may also enter magnifications not on the list. Your image analysis program will then use interpolation to ensure that the image calibration is correct.

Acquire an image

5) Select the Image > Acquisition command to display the camera image live onscreen.
   - ► As long as live acquisition is ongoing, the camera icon blinks in the status bar and the input-channel name will be red.
   - ► The live image will be shown in the active viewport.
   - • The size of the image within the viewport will depend on what you have selected on the Image scaling setting on the Display tab (Image > Configure Input...).
6) Optimize illumination, position and focus of the object in the microscope.

7) Select the Image > Camera Control... command to optimize acquisition quality by adjusting exposure time as well as color, brightness, contrast and focus settings.
   - • Close the Set Input dialog box because otherwise the Camera Control... command will not be available.
   - • The functionality of the Camera Control dialog box will depend on what kind of camera you are using.

8) Select the Image > Snapshot command to finish live image acquisition.
   - ► The image will be written into the active image buffer. Now it may be edited, evaluated and archived.
   - ► The image is given a standard name. This name is determined by the Prefix for images and Incremental number settings in the Image tab (Special > Preferences...).

- You may of course acquire a snapshot without having to go into the live mode first.

Calibrating inputs

Background information

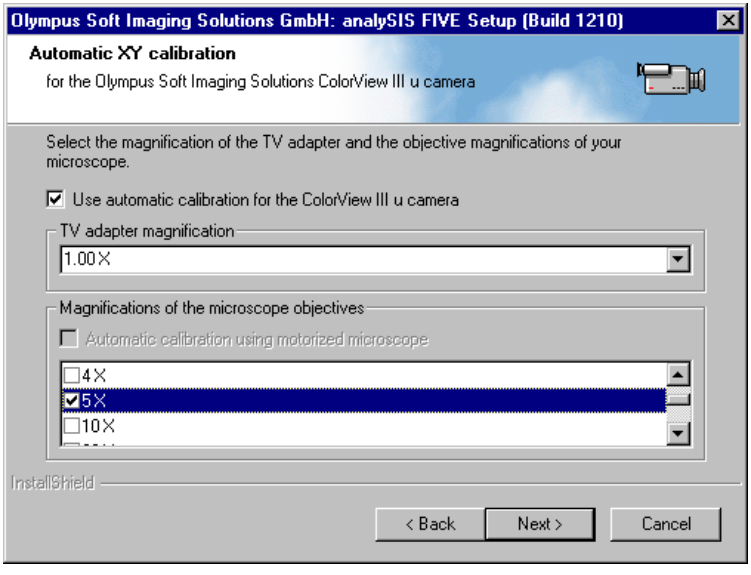
Calibrating inputs

Calibrating a logical input is for defining the calibration for all images acquired via this input. The pixel calibration data is decisive, in doing so. The pixel calibration data indicate which area of the object is covered by one camera pixel. They are different for each magnification. To acquire correctly-calibrated images, the input must be correctly calibrated.

Precalibrated inputs

When working with a light microscope, the input channel can be precalibrated. This only holds true for cameras manufactured by Olympus Soft Imaging Solutions. The pixel calibration data is calculated from the camera's pixel size and the microscope's total magnification. During installation of the image analysis program, you determine whether or not you can or want to use precalibrated inputs.

You will be informed via this dialog box during installation if a precalibration of the input channels is possible. Select the Use automatic calibration for the ... camera command to install precalibrated input channels.


Olympus Soft Imaging Solutions GmbH: analySIS FIVE Setup (Build 1210)
Automatic XY calibration
for the Olympus Soft Imaging Solutions ColorView III u camera
Select the magnification of the TV adapter and the objective magnifications of your microscope.
Use automatic calibration for the ColorView III u camera
TV adapter magnification
1.00X
Magnifications of the microscope objectives
Automatic calibration using motorized microscope
4X
5X
10X
InstallShield
< Back
Next >
Cancel

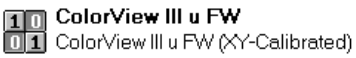
Please note the following points during automatic calibration:

Requirements for automatic calibration

- Automatic calibration is only possible for light microscopes and certain camera types.
- You can only use the automatic calibration if you do not use a magnification changer on your microscope and your microscopes tube factor is equal to 1.
- In order to be able to exactly determine the end magnification of your system, you must supply the magnification of your TV adapter during installation. The TV adapter can be found between the microscope tube and the camera. The magnification is usually shown on the TV adapter.
- You cannot use the automatic calibration for stereo microscopes.

Please note

- You will recognize precalibrated input channels in the Set Input dialog box by the (XY-Calibrated) extension.



- During installation, provide the objectives which are to be used on your microscope. Only the objectives selected during installation are shown and offered in the Set Magnification dialog box and can be conveniently selected from a list. Should your light microscope be remote controlled, you do not have to provide any objective magnifications, since the magnification is automatically selected.
- Should you decide to change your objective after software installation, you can also provide a magnification during image acquisition which is not provided in the list. The image is then correctly calibrated, based on the automatic calibration data, even if the magnification is not provided in the magnification list.
- It is always possible to manually calibrate even a precalibrated input channel. In doing so, the predefined calibration data is overwritten. To avoid this, duplicate an input before altering the calibration data.
- Should you update an already existing software version: Always select the Update option during setup. In this case, already existing input channels will not be altered. The precalibrated inputs will be additionally installed.
- Check a precalibrated input. This makes sure that the end magnification of your system has been correctly calculated.

Calibrating images

The calibration data of an existing image may be modified at a later point in time. This will be necessary if you have acquired an image using a non-calibrated input - e.g., using a scanner. In this case, the XY-calibration is automatically set to "1 Pixel / Pixel". Any image you wish to calibrate after acquisition must of course contain a distance of known length, e.g., a scale bar. Use the Image > Calibrate Image... command.

Setting magnification

To ensure that your images are correctly calibrated, you must reset the magnification within your image analysis program before the first image acquisition and anytime you change the magnification on your microscope. To redefine magnification for the active logical input simply use the Image > Set Magnification... command.

Remote control

Your image analysis program can operate numerous light microscopes and electron microscopes via the remote control. If you have a remote hook-up, your microscope's currently-set magnification will be automatically read. To activate the remote select the Remote > On check box on the Image > Configure Input... > Magnification tab.

Step-by-step

Calibrate inputs

This step by step instruction is only relevant if you have not selected an automatic XY-calibration during the installation of your image analysis program. You can also use this step by step instruction if you want to recalibrate objectives which were not provided during installation.

Setting acquisition conditions

1) Before starting the calibration, check the acquisition conditions. The following settings guarantee that you can execute a calibration without any problems.
   - Select the Image > Acquisition command to display the camera image live onscreen.

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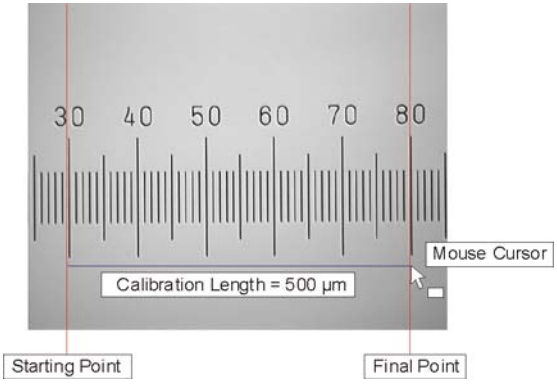
Check calibration data 41

- Open the camera controls and click the Auto button enable the exposure time to be calculated automatically.
  Activate the automatic gain display in the camera controls. This guarantees that the acquired images will not be so dark that the calibration length is no longer recognizable when using higher magnifications.
- Select the Image > Snapshot command to finish live image acquisition.

2) Place a suitable calibration specimen, for example a stage micrometer, into your microscope and focus.

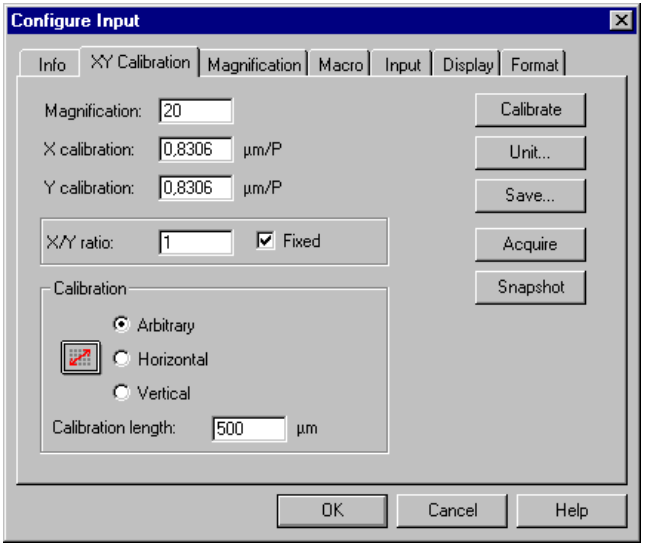
The sample image (right) shows a calibration scale in a light microscope at a magnification of 20.



3) Maximize the image window and set the zoom factor to at least 100%.

4) Select the Image > Configure Input... command (or click on the Configure Input button of the Set Input dialog box) to calibrate the current logical input channel.

5) Select the XY Calibration tab.

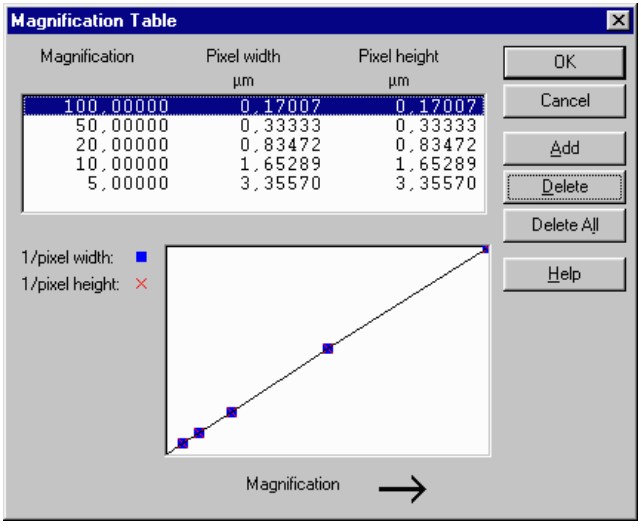


6) Click on the Unit... button.

- Select m (for meters) in the Basic unit list in the Set Unit dialog box.
- Select, e.g., µ in the Scale list if you wish the calibration length to be shown in µm. Confirm by clicking OK.

7) Select the appropriate X/Y ratio for your camera.
   - Your camera normally has square pixels. In this case, enter the value 1 in the X/Y-ratio filter. Select the Fixed check box.
8) Set your microscope to the lowest magnification level available.
9) Enter this magnification level into the Magnification field. When using light microscopy, you generally use the objective magnification.
10) Click on the Snapshot button to acquire an image of the calibration specimen. The image will be put into the active image buffer.
    - Use the live image onscreen to position and focus the calibration specimen. Simply click on the Acquire button first. When you're satisfied, quit the live mode by clicking on Snapshot.
11) Enter the length you are using to calibrate with into the Calibration length field.
    - The distance between the scale marks 30 and 80 in the example shown is 500 µm.
12) Select the Arbitrary option in the Calibration group.
13) Now click on the Calibrate button.
    ► The mouse pointer will appear within the active image.
14) Position the mouse pointer at the starting point of the calibration length and leftclick.
15) Then position the mouse pointer at the final point of the calibration length and confirm by leftclicking. The blue line must be the exact same length as the calibration length you entered.
16) Click on the Save... button to open a list of calibration data for various magnifications.

The magnification table is where you check your calibration data. The diagram shows the reciprocal pixel size versus magnification. The points should all be along one line. You may also set the magnification of an input channel to a value that is not in the magnification table. To do so, use the Set Magnification... command. Interpolation is then used.



17) Select any value in the Magnification Table dialog box and click the Delete All button should there be any invalid calibration data in the list when beginning.
18) Then click the Add button to add the data of the calibration you have just completed to the magnification list and have it included in the diagram as well.
19) Exit this dialog box by clicking on OK.

20) Now set your microscope to the next magnification level.

21) Repeat steps 6 through 16 for all other magnifications. The last calibration should thus be conducted at the greatest magnification level.

22) Confirm your input calibration by clicking on OK.

23) Once again set the acquisition parameters which you use as default for image acquisition.

Check calibration data

Even when you are using a precalibrated input, check the calibration data.

1) Display a calibration object with your microscope, for example a stage micrometer with a total length of 1 mm.

2) Select the Image > Set Input... command. Select the input which you would like to check.

3) Select the Image > Set Magnification... command. Select the current magnification.

4) Select the Image > Acquire command to acquire an image of the calibration object.

5) Use the key stroke [Alt+4] or click the Measurements Bar button to show the button bar with interactive measurement functions.

6) For example, click the Arbitrary Line button.
   - ► The pointer jumps into the image.

7) Measure the length of a segment on the scale. Using the left mouse button, click once on the starting and endpoints of the segment to be measured. Click the right mouse button to return to the user interface.
   - ► The length of the segment to be measured is shown in the image overlay. Should the measurement result not correspond with the actual length of the segment, you must calibrate the input again.

Saving images

Background information

Image name The image name is the name of the image in the image buffer. This name is not necessarily the same as the file name or the image/record name of the image in the database.

File name The file name is the name the image is saved as on the hard disk, for example.

Record name The record name is the name the image is saved as in its database.

Default image name At image acquisition the image is named according to a default name. This presetting can be altered: Special > Preferences... > Image acquisition > Prefix for images / Incremental number.

Image buffer for image acquisitions The image is written to the active image buffer by default during acquisition. If an image is already in the image buffer, it will be overwritten during acquisition. Therefore, it is recommended to check the image buffer for any acquisitions before starting the image acquisition.

To avoid accidentally overwriting images when acquiring images, you have the following possibilities: Use the Special > Preferences... command. Select an appropriate entry from the Image acquisition > Sequence list located in the Images tab:

- None: An acquired image is written to the active image buffer. Should this image buffer already contain an image, that image will be overwritten. This entry is preset by default.
- Image buffers (All): Your image analysis program will now automatically select the next image buffer before each new image is acquired. Should this image buffer already contain an image, that image will be overwritten. Please not that the images are not automatically saved as a file. Therefore, you must either insert the images into a database or save them as a file by using the File > Save As... command.
- Image Buffer (Circular Switch): Your image analysis program will now automatically select the next image buffer before each new image is acquired. Only the image buffers which belong to the current circular switch will be taken into consideration. The first 8 image buffers are by default. If image buffer 8 is the active image buffer, image buffer 1 is again going to be the next image buffer which is selected.
  Every loaded image takes up space in the memory. Select this option to avoid filling the image buffer with a large amount of unnecessary images.
- Database: An acquired image is written to the active image buffer and simultaneously inserted into the active database. The image is thus automatically saved as a file. You do not have to additionally save acquired images with the File > Save As... command.
  Please note: The program tries to insert the acquired image beneath the active database element. You will get an error message if the active database element does not allow the insertion of images. Images can be saved below a database folder or an image, but not directly below the database symbol or below a document.
  The insertion mask is not shown. All of the user defined database fields remain empty for the inserted image. The Database > Edit Record... command enables you to provide data about all of the inserted images at a later time.
  The record name in this case corresponds to the image names.
- Database (Input Mask): An acquired image is written to the active image buffer and simultaneously inserted into the active database. The input mask is opened after each image acquisition enabling you to put all data with regards to the image directly into the database during image acquisition. You can, for example, reissue the record name for each image.

Macros for your input channel

The input-channel concept includes defining basic macro commands for the input channel. Select the Macro tab in the Configure Input dialog box to enter macro commands to be executed either before or after the acquisition of an image.

- You may, e.g., set magnification before image acquisition. To do so, enter the following row into the Preprocessing steps field:
  SetMagnification();

Warning

Please note the following when working with ColorView *IIIu*. Do **not** define this command in the input channel when you are using the online shading correction. The online shading correction works with reference images which depend on the selected magnification. If you change the magnification after having started the live-image, a false reference image will be used for the correction.

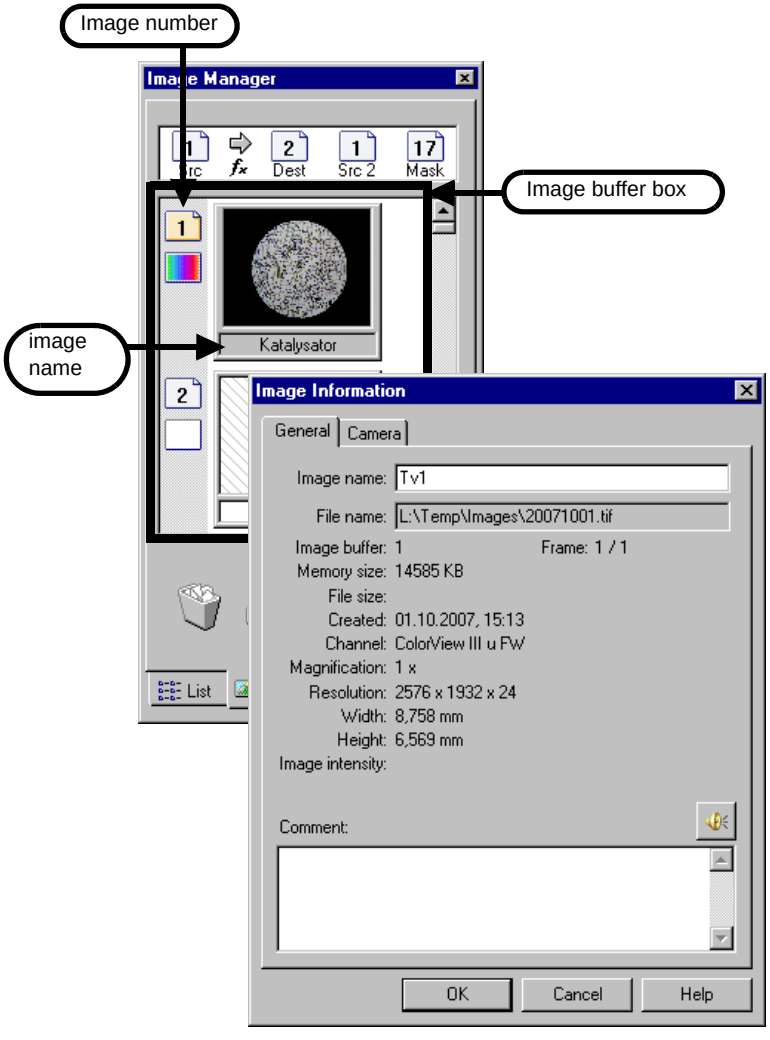
- You can for example, adopt the scale bar into the image-overlay after image acquisition. To do so, enter the following row into the Postprocessing steps field:
  ScaleBarToOverlay();

Image Information

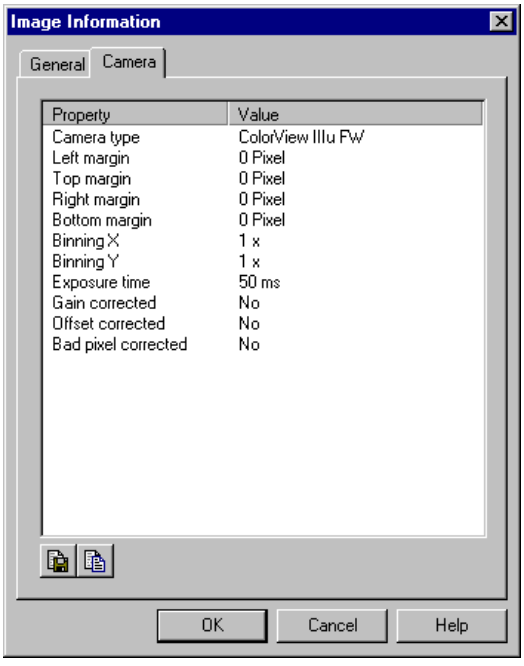
A large amount of additional data will be automatically acquired together with the images. All additional data are accessible in the Image Information dialog box. You can, for example, open the image information by double clicking on the image buffer. Depending on the acquisition method, the dialog box can contain different types of tabs.
Each image you load into your image analysis program will at least contain the General tab with the image names and the general image data. Here, you can also write comments about the image. You can also acquire audio commentaries, should you have access to the necessary hardware.
When you acquire images with your image analysis program, you will also find the Camera tab with the most important camera settings.
For certain microscopes, you can also automatically acquire data about the microscope together with the image. Some add-ins also create additional tabs with special image data in the Image Information tab.

Please note: Save your images in TIF format so as to save all additional data together with the image.

Image information includes all information saved along with the image.
In the example shown, the image name and the file name are not the same.
Any information you wish to have archived along with the image may be entered in the field for comments.
The absolute width and height of the image result from the calibration of the input channel.
Click the button with the speaker symbol to show the Audio button bar. Use the functions in the button bar to record a spoken comment about the image.



The Camera tab contains the settings of the input channel during acquisition.



Print image comment

You can print the image comment together with the image. This can be done either by using the File > Define Page Layout... command, or by using the report generator that is integrated in your image analysis program. In the page layout, acquire the ${Comment} wildcard in the header or footer. When using the image generator, save the image to an image database and then insert the Image Comment database field to a database object.

Step-by-step

Change an image name after it's been acquired

1) Doubleclick on the image buffer to change the name of the image in the active image buffer.
   - ► The Image Information dialog box will be opened.
   - • The General tab has all the image information automatically read out at image acquisition.
   - • The Camera tab has all the data of the logical input channel the image was acquired with.
2) Enter the new image name into the Image name field in the General tab.
3) Enter any comments on the image you wish to make and evaluation thereof into the Comment field.
   - • Use key words of the image comment to query the image in an image database, if you have archived it in one, of course.
4) Confirm by clicking OK.
   - ► The image buffer will automatically show the new image name.

➤ This image name is now the default name and will be proposed when you go to save the image as an image file or as a record to be inserted into an image database.

Read in magnification automatically at image acquisition

Add the Image > Set Magnification... command to the logical input channel.

1) Doubleclick on the input channel icon in the status bar.
   ➤ The Configure Input dialog box for the active logical input channel will be opened.
2) Select the Macro tab.
3) Enter the function name of the command desired into the Postprocessing steps field and put a semicolon at the end of the line: SetMagnification$();
4) Test the little macro. To do so, click the Execute button.
   - If you receive an error message then check your spelling of the command name.
   - If the Set Magnification dialog box is opened your macro functions correctly. Then click on OK.
5) Select the Enabled check box.
6) Exit the Configure Input dialog box via OK.

7) To test the input channel: click the Snapshot button in the Standard button bar.
   ➤ Your image analysis program will open the Set Magnification dialog box after image acquisition.

Showing scale bars

Background information

Automatic scale bar

You can show scale bars in the viewport. These show you the calibration of the image(s) continuously as you work no matter what the viewport settings are.

Scale bars and image calibration

Your image analysis program computes the length of the scale bar based on current image calibration. Make sure that your images are always correctly calibrated.

- Images you acquire via your image analysis program will automatically be correctly calibrated as long as the logical input you're using is calibrated properly and the actual magnification is set.
- When working with images you import from another application or read in via the TWAIN interface be sure to use the Image > Calibrate Image... command before having the scale bar shown.

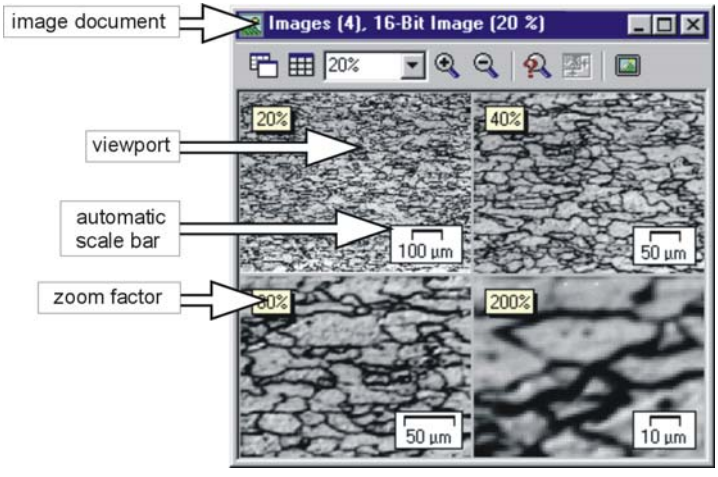
WARNING: The automatic scale bar is not a part of the image overlay. It is a viewport property. The scale bar is linked to the coordinate system of the viewport and is shown in a fixed position, i.e., size, position and font size remain unchanged even when you move the image within the viewport or change its zoom factor. The calibration length will always be adjusted to fit the current zoom factor of the image in the viewport. You may also have the unit automatically adjusted in order to avoid excessively large or small numeric values.

Step-by-step

Show scale bars

1) Load a correctly-calibrated image into the active image buffer.
2) Press [Shift+F4] to make the scale bar appear/disappear onscreen.
   You may also select the Image > Scale Bar > Show in Viewport command.
   - ► Scale bars appear in the lower-right corner of viewports.
   - • Showing scale bars is a global setting. This means that either you have scale bars shown in *all* viewports, or in *none* at all.

The image document is divided up into four viewports in the above example. All four viewports show the same image but at different zoom factors.

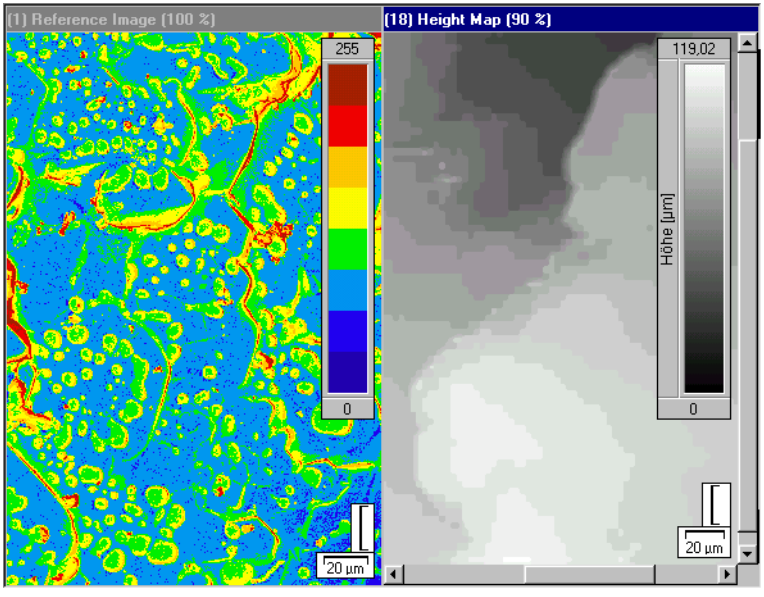


Alter scale bar properties

1) Select the Image > Scale Bar > Properties... command.
2) Select the Display tab in the Scale Bar Properties dialog box. This is where you define what automatic scale bars you wish to have shown and where.
   - • Select the type of scale bar desired in the Scale bar selection group. Besides the usual horizontal scale bar, there's a vertical scale bar and a palette bar to choose from. The palette bar shows how colors and gray values correspond in false-color images. When using gray-value images whose image intensity has been calibrated, the values for the intensity are provided.
   - • Define where the automatic scale bar(s) are to be shown in the Show scale bar for group. Have the scale bar shown in viewports onscreen (Viewport), printed out (Printer) or copy it into the clipboard (Clipboard). Any combination of the three application areas may be selected.
3) Select the Format tab to define how the scale bar is to look.
   - • There are three types of different scale bars to choose from in the Scale bar styles group. Scale bars may have a white or yellow or transparent frame. Select any color to label the scale bar for transparent frames.
4) Select the Size tab.

- Select the Adjust to printer frame check box if you wish to export images and automatic scale bar into another application program - e.g., MS Word - via the clipboard. Scale-bar size will be adjusted to actual print size of the image. This of course requires that subsequent print size be known and is entered correctly.
- Select font size for printing out, copying into the clipboard and burning the scale bar into the image in the Clipboard / Burn image group.
- Enter/select the font size desired for labeling all scale bars into the Font size field. The font size selected here does not affect onscreen display of scale bars.

5) Confirm by clicking OK.
   - All scale-bar settings are global settings; i.e., they apply to all loaded images.



Show horizontal scale bars within images, as well as vertical scale bars and palette bars, too. Palette bars show how colors and gray values correspond in false-color images (left). In images with calibrated image intensities palette bars show how gray values and image intensity values correspond (right). The above example shows a height map as it is generated by, e.g., the Stereo add-in

Saving/Printing/E-mailing

Saving images

Background Information

Saving images

You save individual images with the File > Save As... command. You should save your images as TIF files. Only when using TIF format are the additional image attributes (overlay, image calibration, channel data, microscope data, image comment) saved together with the image.
You have the possibility of:

- saving images compressed,
- burning the overlay when saving,
- saving a 16-Bit image as 8-bit.

Image file formats

Images have to be in a specific format so that they can be read, edited and saved. The image format determines, e. g., the image type, image width and height, file extension, LUT position and pixel values.

Your image analysis program supports numerous image formats ranging from the most common to more specialized formats used by certain systems for image generation.

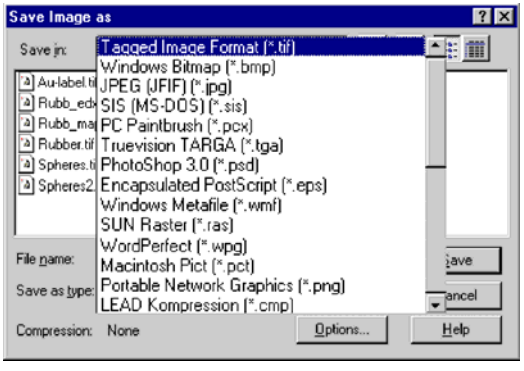


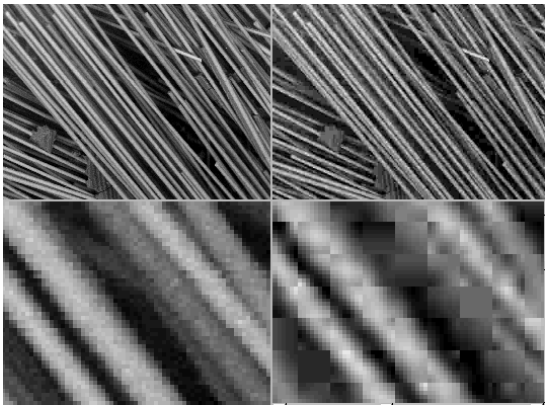
Image database

If you have lots of images to save, it's a very good idea to set up an image database. The database eliminates having to manage image files and also provides you with a broad range of search options so that relocating the image(s) you need is no problem at all.

Image compression

Your image analysis program supports a broad range of compression methods for reducing the file size of images you're saving. This is important when, e. g., you wish to e-mail images.
The JPEG compression method provides excellent results for gray and true-color images. JPEG does, however, cause image artifacts: the higher the degree of compression, the more the artifacts.
JPEG compression reduces file size considerably.

compression	file size
none	4.097 kB
JPEG, quality: 75%	504 kB
JPEG, quality: 50%	327 kB
JPEG, quality: 25%	219 kB



Uncompressed image at 50% zoom (upper-left) and 400% (lower-left) JPEG-compressed image (quality: 5%) at 50% zoom (upper-right) and 400% (lower-right) High magnification (lower-right) clearly shows the artifacts resulting from extreme JPEG compression.

Step-by-step

Saving images

1) Activate the image buffer containing the image you wish to save.

2) Select the File > Save command.
   - You can also save the image by simply dragging & dropping it onto the save icon in the image manager.
   - ► The Save Image As dialog box will be opened.
3) Enter the path of where you wish to save the image.
   Enter a name you wish to save the image as into the File name field. Your image analysis program will automatically propose the image's current name to be used as the file name.
4) Select the desired image format from the Files of type list. The TIF format (Tagged Image Format (*.tif)) is advisable generally.
   - The File > Arrange Image File Formats... command is for putting image formats into the order you wish, i.e., most frequently-used formats at the top of the list; image formats you don't need can be disabled.
5) Click the Options... button in the Save Image As dialog box to access general settings related to saving images.
   - ► The Save Image Options dialog box is opened together with the TIFF tab.
6) Select one of the compression methods offered from the Compression list. Select the None entry to save the image uncompressed.
   - Please note: When an image is compressed, this generally results in artifacts. Therefore, you should only compress images that you have finished analyzing or measuring.
7) Define how image overlays are to be treated.
   - Clear the Burn overlay into image check box. The image overlay will thus be saved along with the image, but will remain a separate object in the image file. This means that the image and the overlay can still be displayed separately and also be edited when you load the image file. No image information is lost in the process.
   - Select the Burn overlay into image check box when you're planning on exporting the image to another application, e. g., MS Word. This is the only way that overlay information can be read by another application.

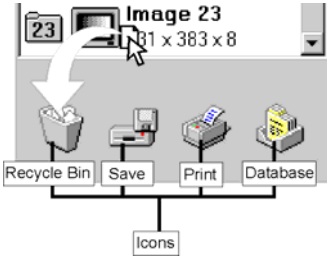
8) To confirm these settings, click on OK.
   - ► You will be returned to the Save Image As dialog box.
   - ► The Compression field shows the current compression method.

9) Click the Save button.
   - ► The image will be saved at the path selected.

Deleting images in image buffers (i.e., the image manager)

1) Select the Image > Delete Image command to delete the image from its image buffer.
   - ► The image is simply removed from the image buffer. The actual image your have saved is not affected by this command.
   - • You can also 'throw out' an image by simply dragging & dropping it onto the recycle bin icon in the lower part of the image manager, or, just press [Del] to delete an image in the image buffer.

Use the icon area of the image manager for quick and easy drag&drop access to basic operations such as deleting, saving, printing and database insertion.



Printing images

Background Information

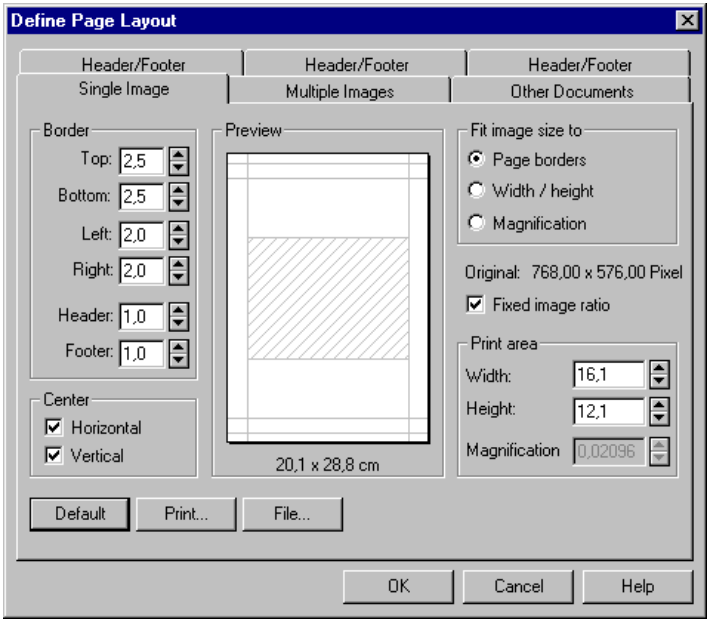
Print Templates

You can determine the print template for different document types. To do so, use the File > Define Page Layout... command. The template contains the page layout of:

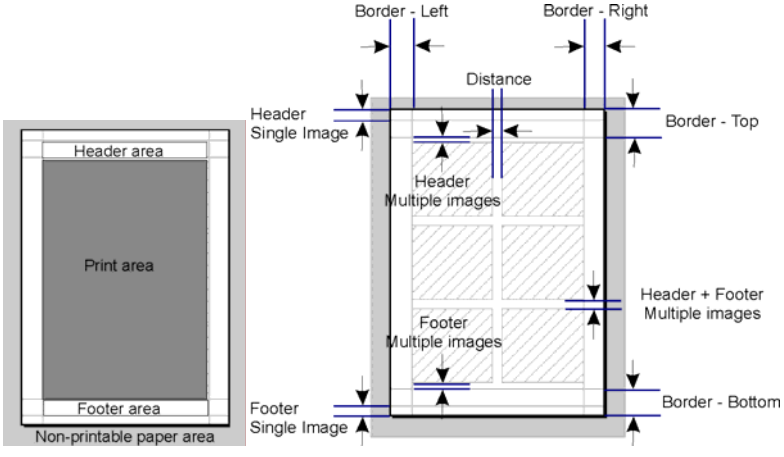
- single images
- multiple images
- database images, and
- other documents, e. g., sheets and diagrams.

A page layout consists of header/footer definition and the position and magnification of images. The report generator gives you many more possibilities as well as very complex page layouts. The report generator, which is integrated into your image analysis program enables you to design a page independently.

You define your own standard page layout for: printing out single/ multiple images, or database images, and for printing out text, sheets, diagrams and graphs as well.



The illustration describes terms which are used in the Define Page Layout dialog box.



Field codes for headers/footers

Use predefined field codes in headers and footers to have certain document properties or information automatically included in your documents. Field codes are always introduced by the following symbol: "$". They are placed in curved brackets. To have an image's name printed out along with the image you would enter the following: ${Name}.

Field codes in headers/footers	
${Name}	image or document name
${Comment}	image comment
${Buf}	image buffer number
${Page}	page number
${Copy}	copy number
${PrintMag}	on-paper image magnification
${Date}	image creation date

${Time}	time of image creation
${Now]	time at printout

Context-sensitive print settings

The File > Print... command is context sensitive and thus dependent on what kind of document is active. If the active document is an image, the Print Image dialog box will be opened. Different document types open respectively different dialog boxes.

Print Directly

Click the Print Directly button in the Standard button bar to print out the active document without having to go through a dialog box. The active page layout will be used when you print directly.

Draft mode

The draft mode is for trial printouts. Gray rectangles will appear at images' positions and header and footer dimensions will also be indicated via rectangles. The actual images will not be printed out, as image prints can be time consuming. Draft-mode printing is a fast and easy way to check out how your layout looks, e. g., when you just want to see what images' exact positions look like on a form.

Step-by-step

Defining multiple-image page layouts for printing out

1) Select the File > Define Page Layout... command.
2) Select the Single Image tab to define header and footer position.
   - Define borders in cm in the Border group. Have a look at the illustration (right) to see what the various fields are for.
   - Both headers and footers may have multiple lines of text. If the text is too long, not all of it will appear when printed; i.e., it will be clipped.
   - Select the Fixed image ratio check box to maintain the image's original length/width ratio when printed out.
3) Select the first Header/Footer tab (the first one on the left, going left to right) to define headers and footers for the whole page.
   - Enter the text desired into the Header and Footer fields: e. g., "page ${Page}, date ${Today}", to have the page number and current date printed on the page.
4) Select the second Header/Footer tab to define a different caption for each image.
   - Enter, e. g., "${Name}" into the Footer field so that the image's name will be printed below the image automatically.
   - Select the Print scale bar check box to have a scale bar printed below each image.
   - Select the Print page header/footer check box to have the page headers and footers defined in step 3 also printed when you print out.
5) Select the Multiple Images tab to define the images' position on the page.
   - Define how images are to be positioned when printed out in the Image tiles group.
     Enter the number of images to be printed out 'across' (i.e., horizontally) into the Horizontal field, and the number of images 'down' (i.e., vertically) into the Vertical field.
   - Define the distance between images and the distance to the headers and footers in the Border group. Page borders will be defined according to the Single Image tab.

6) Click the Print... button to open the Print Image dialog box. Once your have defined the page layout one time, you can simply select the File > Print... command for any future printouts.

7) Select Multiple Images in the Page layout list in the Print Image dialog box.
   - This list also includes Single Image to have images printed out one per page.
8) Select the All images option in the Print images group to print out all images currently loaded.
   - If your have selected the Range of images option, you will need to enter the corresponding image buffer numbers into the field below this option. If you enter, e. g., '4-7,3' - the images in image buffers 4, 5, 6, 7, 3 will be printed out.
9) To start printing, click on OK.
   ► The number of pages printed will automatically refer to the number of images selected.

E-mailing images

Background Information

The following is required

The File > Send email... command is only available if:
- documents are loaded (e. g., an image and a report), and
- you have installed a MAPI-supported e-mail program and MAPI.DLL file.

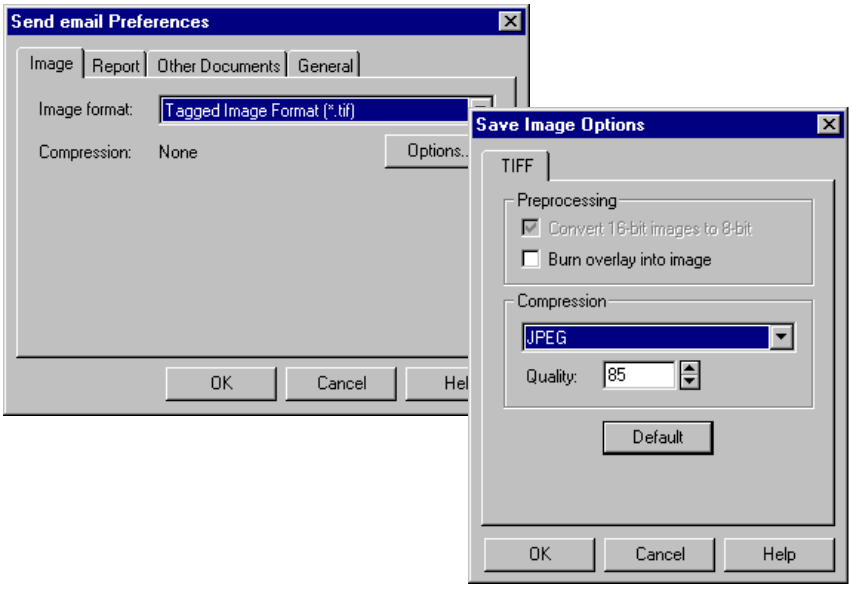
Sending workspaces via e-mail

Select the Add a workspace for the selected documents check box in the Send email dialog box to include a Workspace.wos file along with the other documents you're e-mailing.
The recipient can thus open the workspace along with all images and documents and display these in their original onscreen arrangement. To do this, the recipient will have to save all attachments in a separate directory. To open a workspace along with all other documents, select the File > Workspace > Open... command.

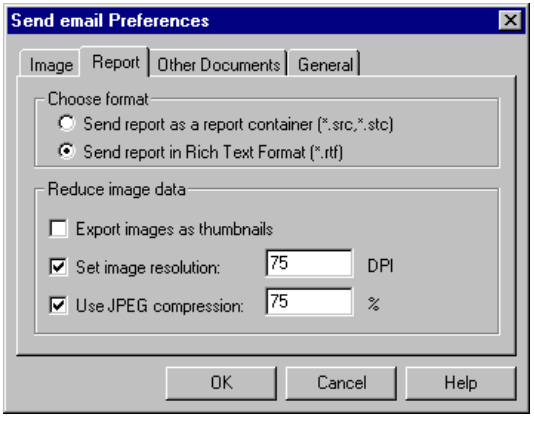
The size of your e-mails

To receive a warning message when the size of your e-mail attachments exceeds a certain limit (which you may set yourself), go to the following tab: File > Send email... > Preferences > General. The following are possibilities to reduce the size of your e-mail:
- Leave out some documents.
- Compress images. Go to the Image and Report tabs in the Send email Preferences dialog box to do this.

Use the Image tab to set the file format for all images that you e-mail. The Save Image Options dialog box enables you to determine for the TIF format whether or not and how the images are to be compressed. You define whether or not 16-bit images are automatically converted to 8 bits, and whether image overlays are burnt into the image before being sent. Please note that the options for saving images are not the same for all image formats.



Use the Report tab , to determine the file format for the reports to be sent. The RTF format has two advantages for the sending of reports: you can considerably reduce the report's file size, and the recipient can open the RTF file report in other application programs, e.g., MS-Word.



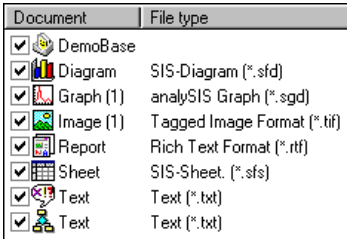
Step-by-step

How to e-mail...

1) Open all the documents and images you wish to send in an e-mail.
   - If you're planning on sending database images and documents, open the database(s) and select the records desired.

2) Click the Send email button in the Standard button bar.
   Or, select the File > Send email... command.
   - ► The Send email dialog box lists all images and documents currently loaded/open in your image analysis program.
   - All the files in this document list are selected by default.

The above figure shows a list of all types of documents that can be e-mailed via your image analysis program as well as their respective standard formats.



3) To clear all selections, simply click the Unselect All button. Select the documents you're interested in by clicking on the corresponding check box in the document list.
   - A warning message will appear if your attachment exceeds a maximum size!

4) Select the Add attached database documents check box to send a record and any appended documents (images, sheets, graphs etc.).
   - An entire image database cannot be sent via e-mail.

5) Click the Preferences... button to set file formats for all images, sheets, diagrams and graphs.
   ➤ The Send email Preferences dialog box will be opened.

6) Select the Image tab in the Send email Preferences dialog box to define the image file format. File formats are always defined for all the respective documents of one single type - not for one single document.
   - The TIF format is default. Select the Burn overlay into image and Convert 16-bit images to 8-bit check boxes for this file format if the recipient will open the images with another application program. This will be automatically done for all other image formats.
   - If possible, compress the images to keep the size of the e-mail to a minimum. Use the JPEG image format if the recipient wants to open the images with another application program since most application programs cannot load compressed TIF images.

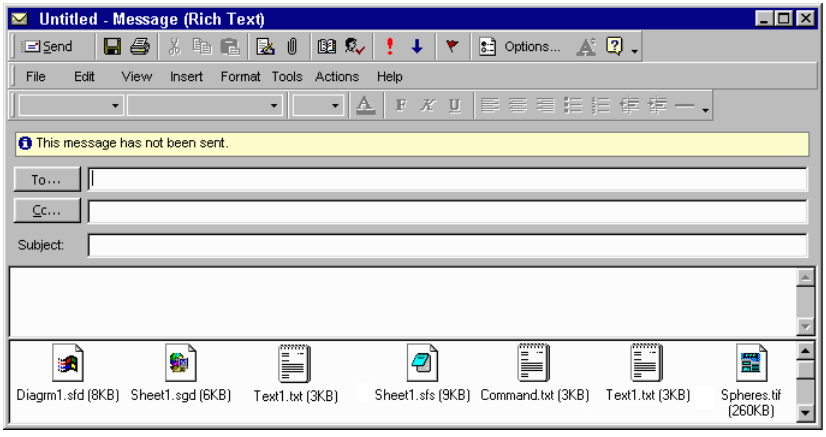
7) To determine the file format for sending reports, select the Report tab located in the Send email Preferences dialog box. Select the Send report in Rich Text Format(*.rtf)option if the recipient wants to open the report in another application program, such as MS-Word. For RTF format, you can reduce the resolution of the images in the report.

8) Close the Send email Preferences dialog box by clicking on OK.

9) Please Note: Select the Custom option in the Send email dialog box to activate the format settings your have just made.

10) Click the Send... button.
    ➤ All image and document files selected will appear as attachments in a new e-mail document.
    - Please keep in mind that as long as the e-mail document is open, all other functions in your image analysis program are not accessible.

All selected documents will appear in the e-mail as attachments.



Archiving Images

Define a database

Set up a new database

Term definition

STAR = STructured ARchive The STAR database is integrated into your image analysis program. It allows the structured storage of all of your images, graphs and documents, such as sheets, diagrams and text. You have fast and easy access to even very large amounts of data all the times. The database has full network capability and can be accessed by several users simultaneously.

Step-by-step

Defining the directories for data storage

1) Select the Special > Preferences... command.
2) Click on the Database tab.
3) In the Locations group select a directory for the storage of all database files. If several users are to access the database, select a network drive which can be accessed by all users.
4) In the Locations group select a Temporary storage directory. This directory is used as temporary storage for files during data saving and archive work in the database.
5) Check the preset backup volume capacity for the backing-up of your database. You can change this setting later when making the backup copy.
   - If you store your database on CDs, enter the volume of the data carrier into the Backup volume capacity field in MB, e.g., 600.
   - If your network database is backed up by the system administrator, enter the value ''0'' into the Backup volume capacity field.
6) Close the Preferences dialog box by clicking OK.

Term definition

Organizational ID All data is entered into a database folder within the STAR database. The name of the folder is defined by the central field of the database, the organizational ID. You define the organizational ID when creating the database and cannot change it for databases that already exist. In an order database, for example, the order number is the organizational ID. In a patient database the patient's name may be the organizational ID. In an express database the "Folder Name" is the preset organizational ID.

Record A record is set up for every document that you enter into a database. Images or other documents, such as sheets, texts, diagrams, graphs, and reports, for example, can thus be stored in the database. The records can be arranged hierarchically in the database.

Database folder The term "database folder" describes a folder within the tree structure of a STAR database. The "database folder" is not a file folder at operating system level. You will find a database folder only in the database window, but not in MS Windows Explorer.

Database fields Database fields contain all the information that you want to store together with a document. The entries in database fields are linked to the relevant document and allow you to easily find any document in the database.

Database types Your image analysis program suggests three ways to create a database:

Express	To store your documents, use the predefined "Folder 1" database folder. You can set up further database folders for document storage at any time.
Template	You adopt the structure from a template model or an existing database.
User-defined	You define the organizational ID and the required database fields in the database. The organizational ID is the central field of your database and may not be altered later for existing databases. In an orders database, for example, the organizational ID is the order number. All documents which are entered into the database must be allocated to the relevant database folder with the order number.

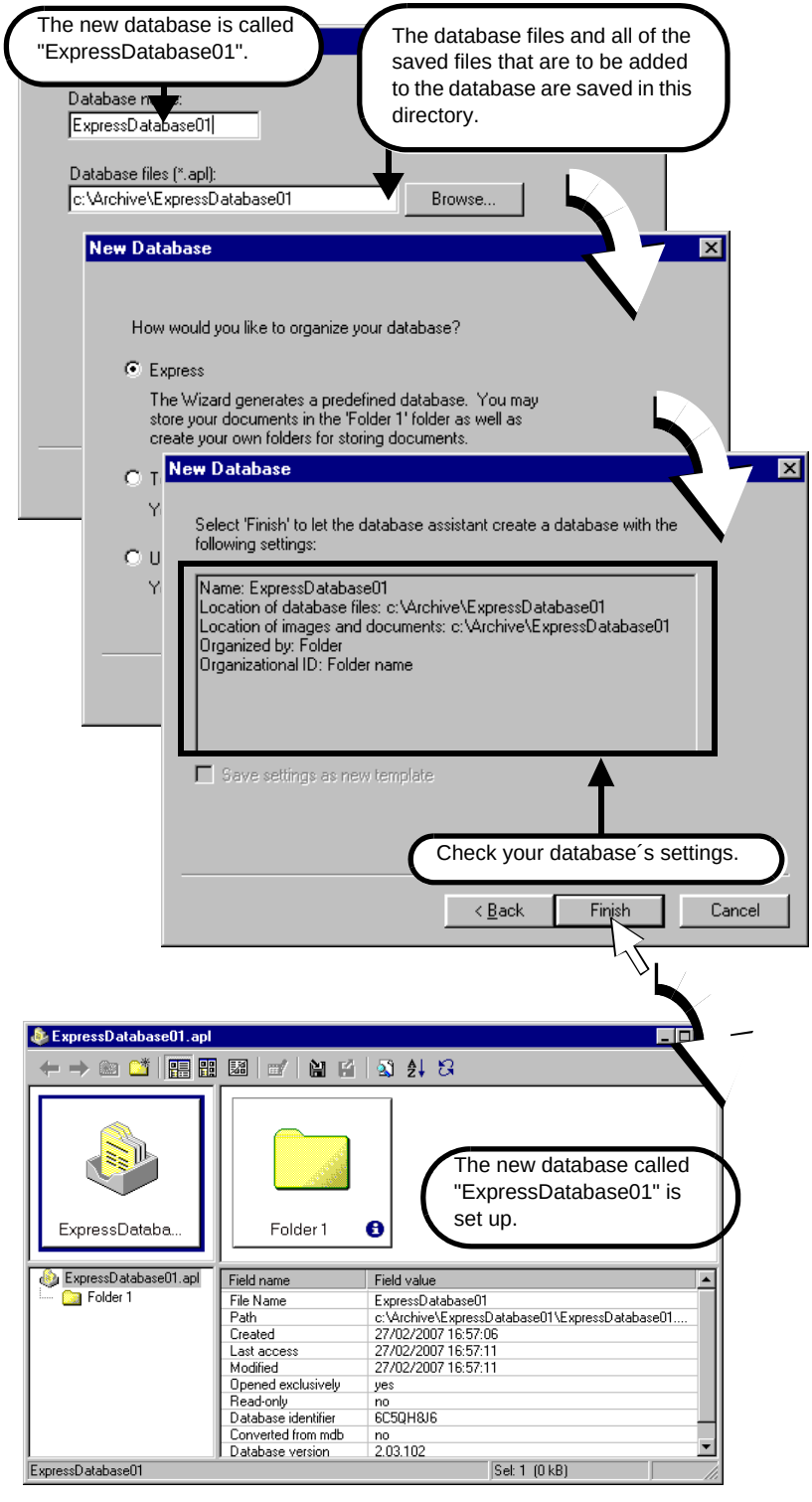
Step-by-step

Set up a new database

A software wizard guides you step-by-step through the setting-up of the database.

1) Select the Database > Administration > New Database... command.
2) Enter the name of your database into the Database name field.
   ► The software wizard suggests an identically-named subfolder in the database directory for the storage of the database files. Even if you change the suggested directory, you should still set up a separate directory for each database.
3) Click the Next > button.
4) Confirm the question as to whether the database directory should be set up.
5) Select the User-defined option.
   Click the Next > button.
6) Enter for example ''Project'' as the descriptive term for the organization of your documents. All data that you enter into the database must be then allocated to a project folder.
   ► Your image analysis program suggests the selected descriptive term with an additional "-No" as the folder name. The folder name defined here reappears later as identifying term in the insertion mask.
7) Click the Next > button.
8) Click the Next > button, without defining your own database fields.
9) Click the Finish button.

How to set up an express database.



Define organizational fields

Background Information

Predefined fields

Predefined fields are provided by your image analysis program and are saved with each record automatically. They contain the image attributes and data which the system assigns on input into the database. They cannot be edited or deleted. An exception is the "Record name" field, the entries in which you can edit while inserting images or editing record names, unless you have determined something else in the Database > Administration > Settings dialog box.

User-defined database fields

User-defined database fields can be set up according to your requirements, e.g., "User", "Project", "Comment" or "Instrument". You can define the data type of the entry for each field. You can also define whether, during the insertion of images,:

- an entry in the field is required,
- a picklist with possible entries is to be offered,
- the entry may only be an entry from the picklist,
- a new entry may be made in the picklist and/or
- the most frequent entry should be suggested as default value.

Organizational fields

An organizational field belongs to the higher ranking database folder. The organizational field contains information which can be related to all the documents within the database folder. This can be, for example, customer and profit center.
All other database fields can be different for every single record. However, the organizational fields have the same value for each record stored in a database folder.

Icons for database fields

The table shows icons used to identify database fields in the Define Fields dialog box:.

	Predefined organizational field
	Predefined database field
	User-defined organizational field
	User-defined database field

Step-by-step

Define organizational fields

You can only define database fields if the database is opened exclusively. Following the setting-up of a new database, the database is opened exclusively.

1) Select the Database > Administration > Define Fields... command.
   ► The Available Fields list contains the organizational ID, e.g.,"Project No", and the predefined database fields.

2) Click the Add New Field button. You will find this button immediately above the Available Fields list.
   ► The Add Field dialog box will be opened. Here you define the new database field's properties.
   ► The name of the new database field will be entered in the Field name field. "User field + consecutive number" will be proposed.

3) Change the standard name of the new user field in the Field name. Enter for example "Customer" as the new user field.

4) The Data type list offers various types of data. Select the Text entry.

5) Mark the Required check box. In this way the customer must always be entered when a new project is set up.

With this step, you decide that the new field is to be an organizational field.

6) Mark the Organizational field check box. This means that the information regarding the customer belongs to all records which are stored under a project.

7) Close the Add Field dialog box by clicking OK.
   - ➤ The new database field has then been set up and will be displayed in the Available Fields list.
   - ➤ All of the database fields are characterized by an icon in the Define Fields dialog box. The new database field will be prefixed by the icon for a user defined organizational field.

8) In the Default group select the option next to the empty editing field. Thus when a new project is set up the "Customer" field is always free and must be re-entered explicitly.

9) In the Picklist group, click on the Edit... button to set up a selection list for the "Customer" field.

10) In the Edit Picklist dialog box enter the name of a possible customer into the Value field, e.g., "Production".

11) Click the Add button to take over the entry from the Value field into the picklist.
    - Check the entries carefully. Typing errors can only be corrected with great difficulty at a later date.

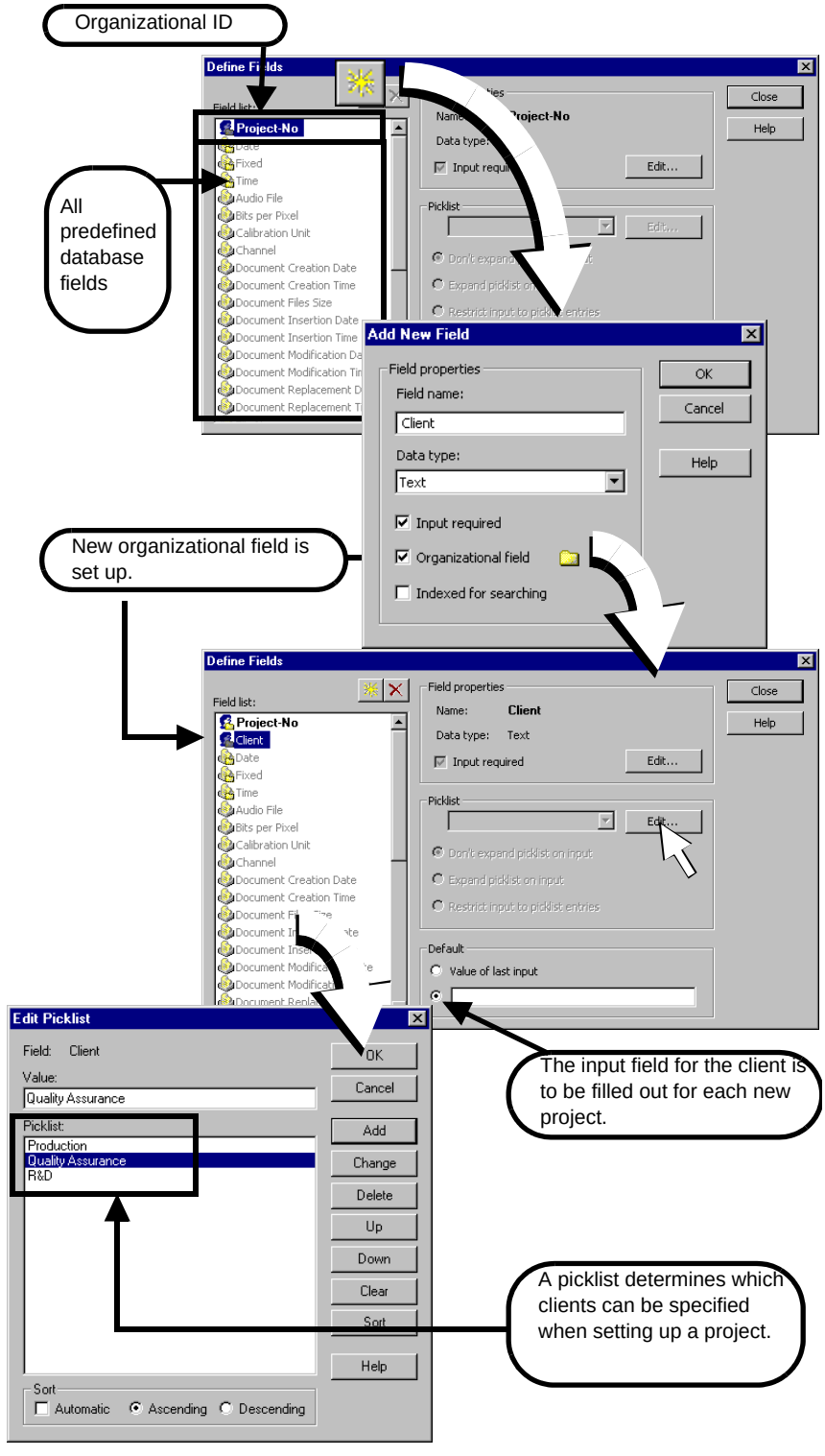
12) Confirm the picklist by clicking OK to return to the Define Fields dialog box.
    - ➤ The Picklist group in the Define Fields dialog box can now be accessed.

13) Select the Restrict input to picklist entries option so that only the given customer can be accepted when creating a new project.

14) Repeat the procedure from step 2, to define further organizational fields such as for example "approved by" or "estimated completion time".

15) In the Define Fields dialog box, click the Close button to complete the definition of database fields.

How to define organizational fields.



Define database fields

Background Information

Open the database

You can open the database using the Database > Open... menu command or through the file list at the end of the database menu.

Open the database exclusively

To open a database exclusively, use the menu command to open the database and mark the Exclusive check box in the Open Database dialog box.
If you mark the uppermost entry in the tree structure, you will see whether a database has been opened exclusively.
You must open the database exclusively if you want to carry out operations which could alter the structure of a database, e.g.:

- defining or editing fields
- deleting the database
- defining a database password
- changing image and document paths
- changing the standard image format

Data types

You can select different data formats for database fields:

- Text: letters and numbers up to a maximum of 255 characters.
- Long: whole numbers, e.g., -10, 0 or 500.
- Decimal number: whole numbers and fractions, e.g., 1.2 (whether a comma or a period is used for decimal fractions depends on the local settings of your operating system).
- Date/Time: The permitted date and time formats depend on the local settings of your operating system.
- Memo: any length texts
- Yes/No: For fields of this data type there is either the status "Yes" or "No". A check box appears during insertion and editing of the record.

Step-by-step

Defining the database fields for the characterization of individual records

A database should contain the field "method of investigation". For every record which will be added to a project in the database, the method of investigation should be included. For images, existing organizational fields are also to be shown in the insertion mask for information purposes.

1) Open the database exclusively.
   - Select the Database > Open... command. In the Open Database dialog box select the database file and mark the Exclusive check box. You can recognize the database file because of the APL file name extension.

Define Fields

2) Select the Database > Administration > Define Fields... command.

3) Click the Add New Field button.
4) Change the standard name of the new user field in the Field name. Enter for example "Investigation method" as the new user field.
5) The Data type list offers various types of data. Select the Memo, option when you want to enter a lot of text in the comment field.

With this step, you decide that the new field is not to be an organizational field.

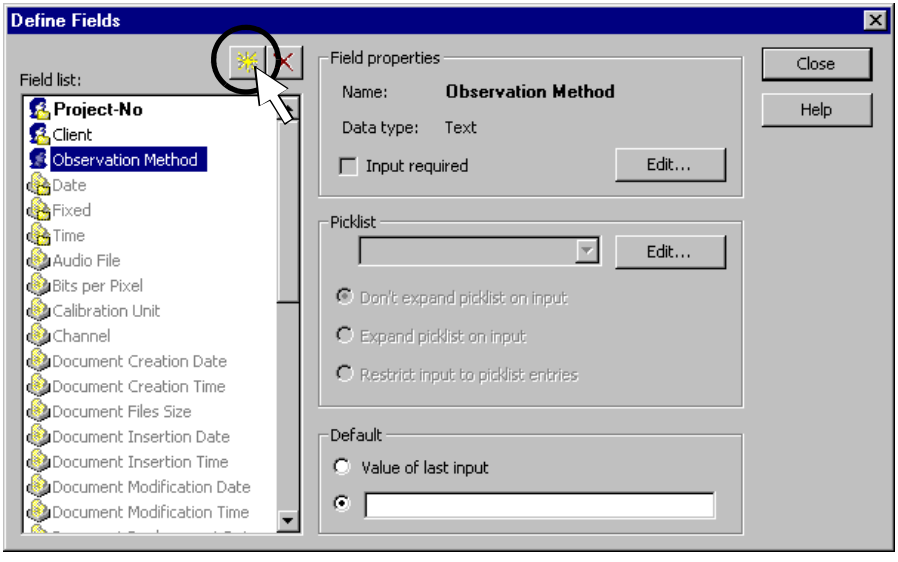
6) The Organizational field check box should not be marked. This way you can allocate a different method of investigation to every record that is added to a database folder.

7) Close the Add Field dialog box by clicking OK.
   - ► The new database field has then been set up and will be displayed in the Available Fields list.
   - ► All of the database fields are characterized by an icon in the Define Fields dialog box. The new database field will be prefixed by the icon for a user defined organizational field.

8) In the Define Fields dialog box, click the Close button to complete the definition of database fields.

Click the button with a yellow star on it to set up a new database field.

In the Available Fields list select a database field to view its properties in the Define Fields dialog box.



Arrange Fields

9) Use the Database > View > Arrange Fields... command.

10) In the View/Type list, doubleclick on the Insert entry to display all data types for the insertion mask.

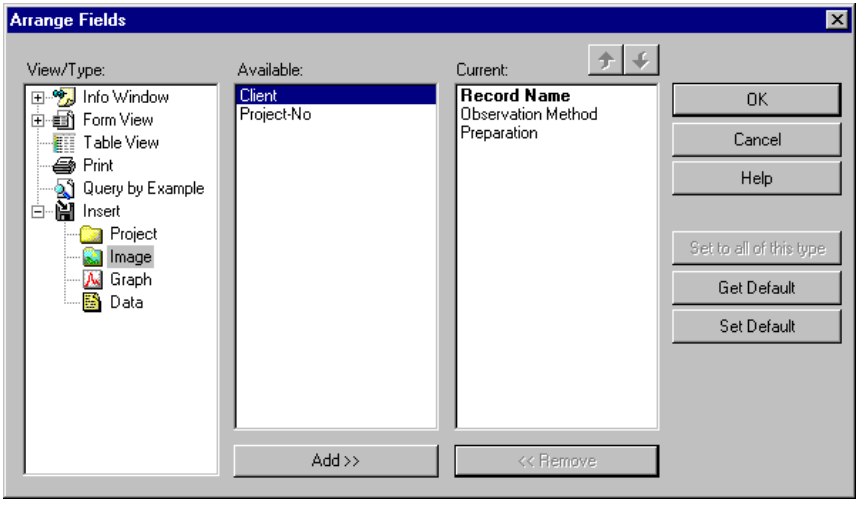
11) Mark the Image entry.
   - ► The Available and Current lists now show all user-defined database fields.
   - • The Current list already includes the predefined Record name field and newly set up "method of investigation" field. The Record Name field must be filled in for every record which is added to a folder in the database. It cannot therefore be removed from the list.
   - • The Available list contains available organizational fields. The information in the organizational fields relate to all the records in a database folder.

12) Select one of the organization fields in the Available list, for example, "Client" from the step by step instruction on page 60, and click the Add >> button.
   - ► If you now insert an image to a project, the method of investigation can be entered in the insertion form. The "Customer" field is provided by way of information.

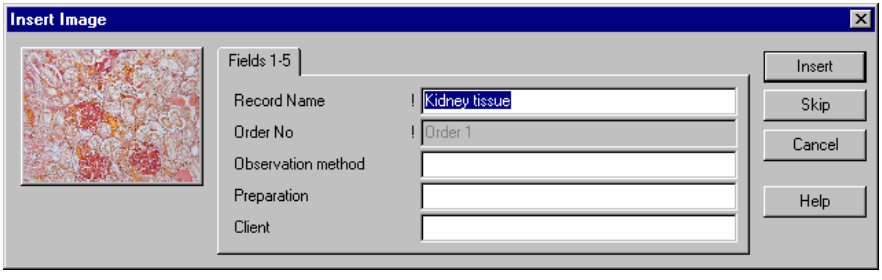
13) Use the arrow buttons to change the sequence of the database fields shown in the form view.

14) Close the Arrange Fields dialog box by clicking OK.

The insertion mask for adding an image contains all of the database fields that belong to the "Add" view, and the "image" data type.



All of the organizational fields, e.g., "Client" will have been already defined when the database folder was set up, and cannot be altered when data is inserted into a database folder.
All required fields are indicated by an exclamation point.



Insert data

Create a new database folder

Background Information

Insert database folder

There are several options for creating a new database folder.

1. Menu command: open the Database > Insert submenu. To set up a new database folder, select the first command in the submenu. This command is different for each database and reflects the organizational ID of your database.

2. Button in the database window: In the database window's button bar, click the <Organizational ID> insert.

3. Context menu: activate the database window and click the right mouse button to open a context menu. Open the Insert submenu. Select the first command in this submenu.

4. Drag&Drop: drag the image that you want to insert into the database from the image manager onto the database name in the tree structure of the database window. You will be asked to set up a new database folder. Confirm the message by clicking Yes.

Database folder name

The standard name for a new database folder is defined in the database settings. Use the Database > Administration > Settings... command to view the settings for the active database . The database must be opened exclusively if you want to alter the settings.

You can use any fixed text and two wildcards.

- The <organizational ID> is predefined as a fixed text. You can replace the <organizational ID> with a text of your own preference.
- <Date> is a wildcard for insertion date. The date format depends on the current settings of the operating system. Your image analysis program uses the short date format selected from the local settings of MS Windows.
- <Cons.No> is a whole number which is increased by 1. Every number is issued exactly once. If you delete the last record with the consecutive number 10, then the next record will be given the number 11.

Step-by-step

Creating a new database folder

You have created a project database with the organizational ID "Project". If you have defined a different organizational ID for your database, for example "Order No." or "Customer No.", then replace the term "Project" with your organizational ID using the following step-by-step guide.

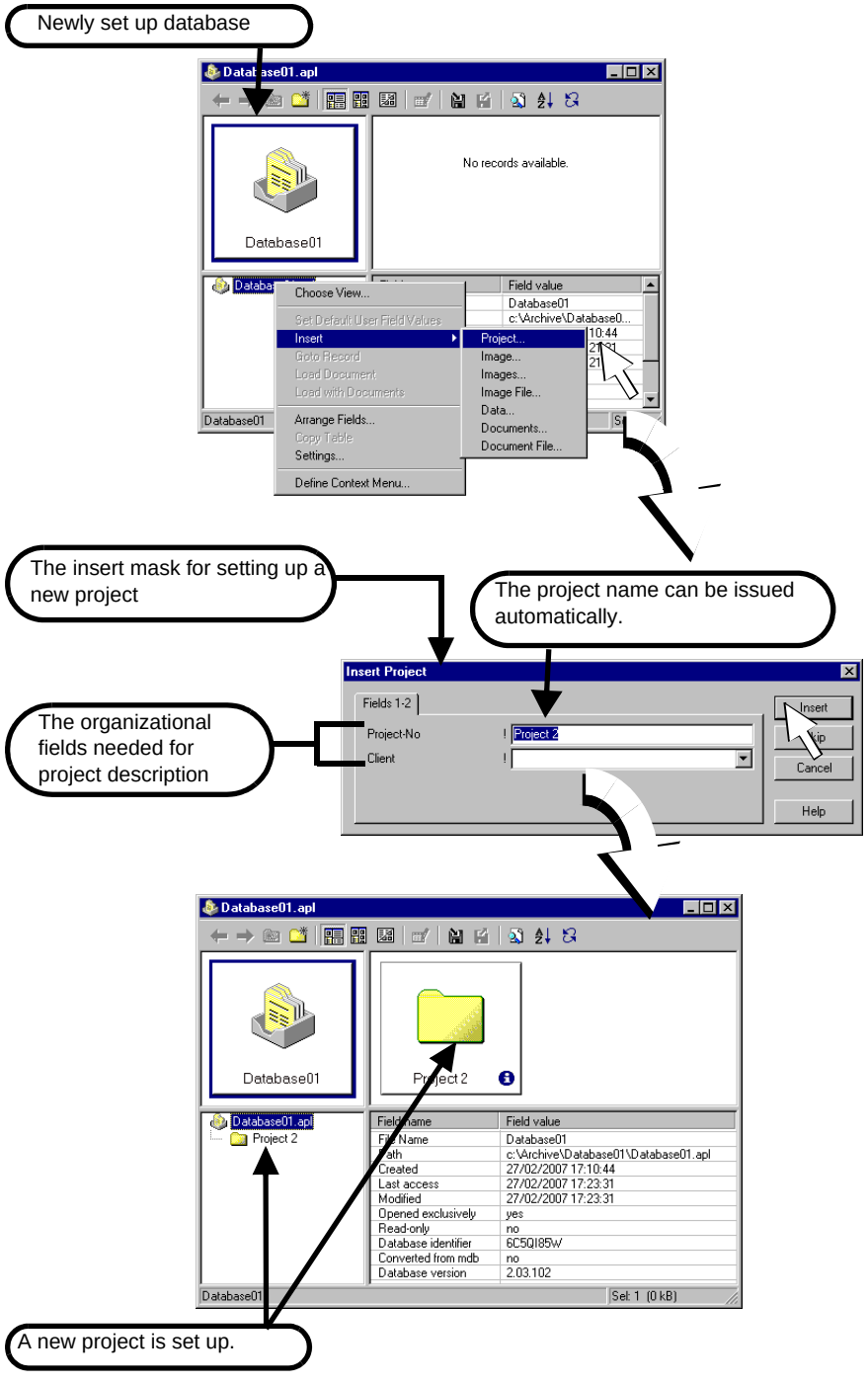
1) Select the Database > Insert > <Organizational ID>... command. The exact command is created dynamically and depends on the organizational ID of the active database. If your organizational ID is called "Project", the command name is then Database > Insert > Project... .
   ► The insertion mask shows all database fields which you have defined in the Arrange Fields dialog box for the Insert view and the Project data type.
2) Enter the required information in the Insert Project dialog box or select an entry from the picklist. Fields which require an entry are marked by an exclamation mark.

3) The automatically created entry "Project <ConsecutiveNo>" will be offered as the project name. You can replace this entry with any other project name. The database will, however, not accept a database folder name that has already been used in the database.

4) Click the Insert button
   - ► In the database window you will find a tree structure on lower left. The uppermost entry in the tree structure is the name of the database. A new project will be created as a database folder below the database name. You can now insert the project data, such as images, graphs, sheets and other documents, into this database folder.
   - ► In the database window you will find a gallery view on the upper right. The new project will be represented in the gallery by a schematic folder icon.

5) Click on the newly set up project in the tree view.
   - ► In the database window you will find a form view on lower right. You will now find information regarding the new project here.
     The form shows all database fields which you have defined in the Arrange Fields dialog box for Form View and the Project data type.

How to create a new database folder



Changing the standard name for a new database folder

1) Open the database exclusively.
   - Select the Database > Open... command. In the Open Database dialog box select the apl file and mark the Exclusive check box.
2) Select the Database > Administration > Settings... command.
3) Replace the organizational ID, e.g., "Project", in the upper Format field with any other text. You can use the wildcards <Date> and <Cons.No>.
4) Click OK to close the dialog box.
5) Set up a new database folder.
   ► The new standard name will now be offered in the insertion mask.

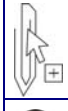
Insert Images

Background Information

Insert Images

There are several options for inserting images into a database folder.

- **Menu commands**: mark the database folder in the tree structure of the database window. Select the Database > Insert > Images... command.
- **Context menu**: mark a folder in the tree structure of the database window and click on the right mouse button to open a context menu. Select the Insert > Images... command.
- **Drag&Drop in the image manager**: drag the images from the image buffer down onto the database symbol in the image manager. The images will then be inserted into the active database folder.
- **Drag&Drop into the database**: drag one or more images from the image manager into a database folder. When you do this you can see the images in an entry in the tree structure. The images will then be inserted below this entry. You can also see the images in a preview window or as thumbnails in the gallery view.
  The mouse pointer will show you by way of its form, whether or not the Drag&Drop operation you want to perform is allowed. The table below shows the mouse pointers you may encounter when you carry out a Drag&Drop operation from the image manager onto the gallery view in the database window.

	The images will be inserted at the same level as the thumbnails that are on display. No records can be inserted immediately below the first level. In this case you will receive a message and you can set up a new database folder.
	The images will be inserted one level below the thumbnails that are on display.
	You cannot insert any data here. That is, for example, the case when six levels already exist below the database folder. Additional data cannot be inserted under a document.

Insert Snapshot

An image can be inserted into the database directly after the image acquisition. To do this, select the Special > Preferences... command. On the Image tab select the Database entry from the Image acquisition > Sequence list.
Before you switch into live mode, mark the database folder to which the image belongs, in the database. During the image acquisition the image will be automatically inserted into the database.

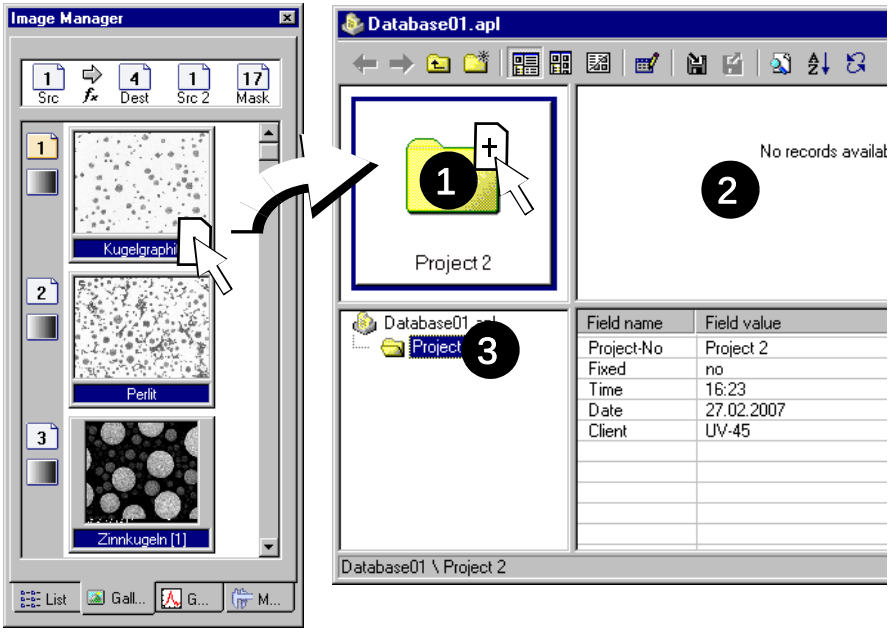
Step-by-step

Inserting images from the image buffer box

The step by step instructions assumes the following prerequisites. You have created a project database. The database already contains a database folder. You have acquired images for this project which are to be filed in the database below the database folder.

1) Mark the project in the tree structure which you want to use for filing the images.
   - ► In the database window you will find a preview window. The preview window shows the record which is marked in the tree structure. If a database folder is marked, then a folder icon is displayed.
2) Mark all the images in the image buffer box that you want to insert.
   - You mark a linked image buffer area by depressing the [shift] key and clicking on the first and last image.
   - You can mark a random selection of images by depressing the [Ctrl] key and clicking on the images you require.
3) You can use drag & drop to move the images from the image buffer box to, for example, the preview window of the project.

Select all the images in the image buffer box that you want to insert into the database. By depressing the left mouse button, you can drag the images to the positions 1, 2, or 3 of your database window.



4) When using numerous images, the Insert Images dialog box is opened (go to illustration on the following page).
   - ► The check boxes in front of the selected images are marked. You can still change your selection at this point.
   - If you only insert one single image into the database, the insertion mask will open directly.
5) In the Prompt for data input group, select the Always option.
6) Confirm the image selection by clicking OK.

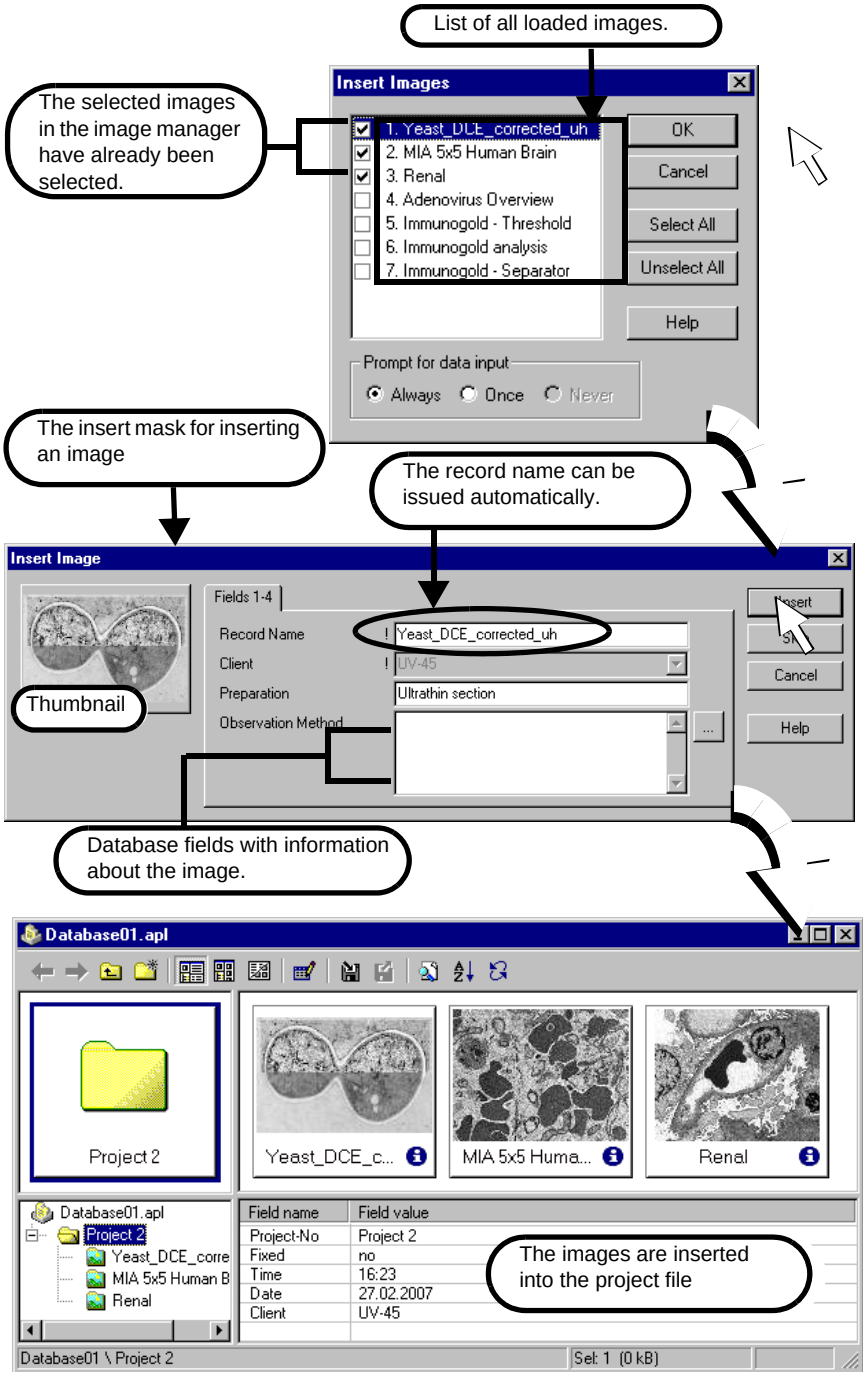
7) The Insert Image dialog box will open for each image which is to be inserted.
   - ► The name of the image buffer is given as a suggestion in the "Record Name" field - unless you have defined another in the Database > Administration > Database Settings dialog box, e.g., automatic record names.
   - ► The insertion mask contains all user-defined database fields which you have selected using the Arrange Fields... command for the Insert view and the Image data type.

8) Fill out the database fields and click the Insert button to open the insertion mask for the next image.
   - ► The inserted images are now displayed in the gallery view of the database window.

9) Click on the plus character in front of the selected database folder in the tree structure.
   - ► In the tree structure, the images will be arranged as an image folder underneath the selected order. You can now insert new images or other documents one organizational level below the images.

10) Click on an image folder in the tree structure.
   - ► The preview window on the upper left now contains the thumbnail of the image folder. The information regarding the image which you have selected using the Arrange Fields... command for the Form View and the Image data type is displayed on the lower right.

When inserting numerous images simultaneously in a database, the Insert Images dialog box is opened.



Inserting documents

Background Information

Documents Documents include all those texts, diagrams, sheets and reports which are loaded in your image analysis program. You can insert documents directly into a database folder or also into another image or data type record.

Differences Differences between documents and records of the image, graph and data type:

- No further data can be inserted under a document.
- You cannot define database fields for documents which provide further information when inserting the documents.
- There is only a limited number of database fields which you can use to search for documents. These include record names, file names, or insertion date and insertion time. Generally, you will find the documents by looking for the higher ranking record.

Document files Document files are data that has already been saved in a file. These may also be files that cannot be loaded into your image analysis program, but which belong to other application programs, e.g., CorelDraw, Excel, Origin, PDF, AVI or Word files.

Inserting document files You can insert document files into the database as follows:

- Mark the record in the tree structure to which you want to attach the document.
- Click the right mouse button and select the Insert > Document File... command.
- Select the correct directory and mark the required files.
- Click the Insert button

Step-by-step

Insert documents

You have created a database. An image is already in the database folder. Now you want to file further result documents in the database folder.

1) Load the documents that you want to insert into the database folder.
   ➤ Documents are diagrams, texts, sheets and reports.
2) In the tree structure of the database window, mark the database folder into which you want to insert the documents.
3) Click on the right mouse button to open a context menu. Select the Insert > Documents... command.
   ➤ The Insert Documents dialog box lists all loaded documents. The check boxes in front of the documents are marked.
4) Clear the check box of a document if you do not want to insert the relevant document.
5) Mark the Prompt for file names check box.
6) Confirm the document selection by clicking OK.
   ➤ The insertion mask for documents opens. In contrast to the insertion of images, you cannot define database fields for documents. The insertion mask therefore contains only limited information about the document and an input field for the file name.
7) Check the file names in the File name field. If necessary, change the document names.

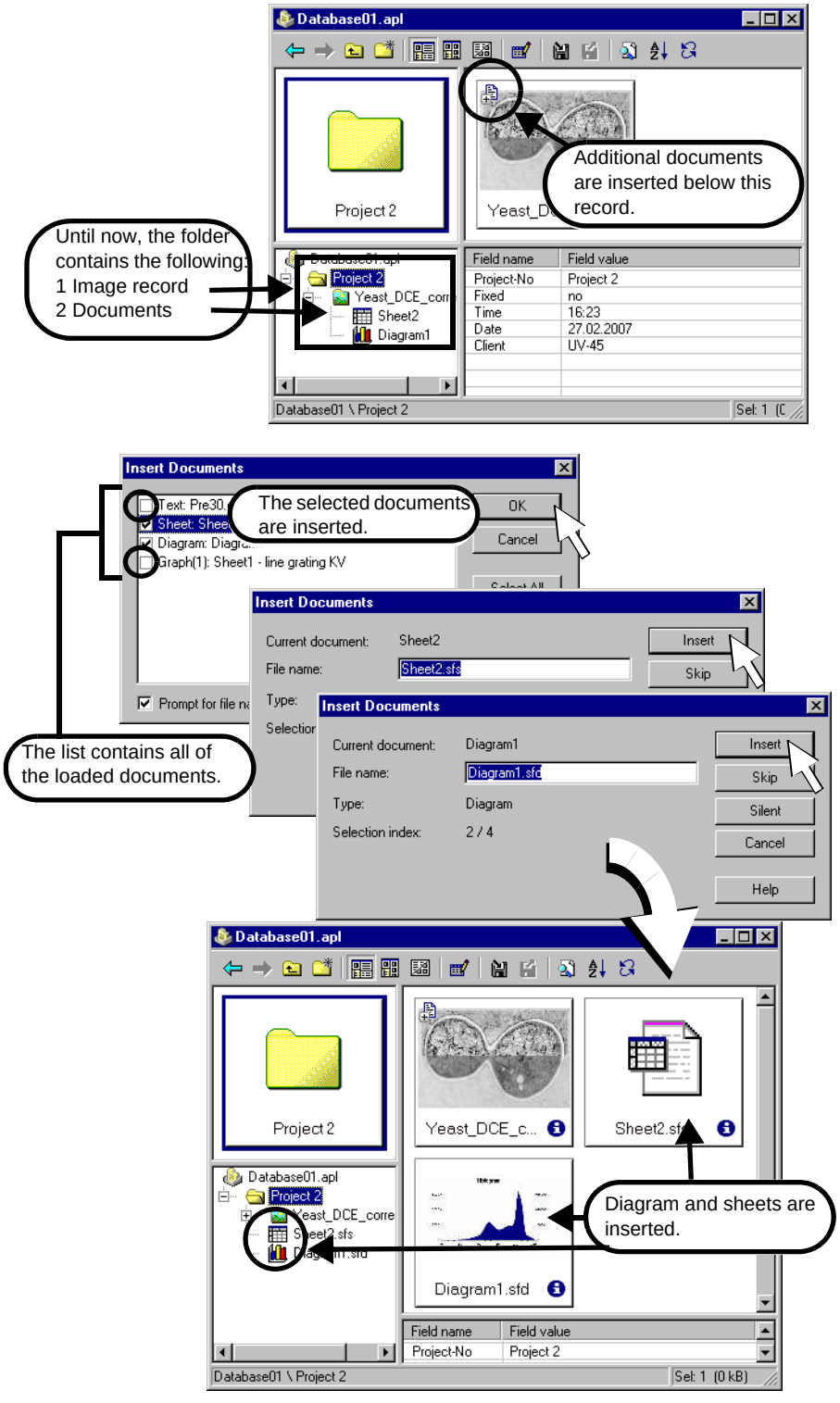
- ► Documents are saved in the file format in which they are normally stored in your image analysis program. This ensures that all documents can be reloaded into the image analysis software. If you want to save a document in another format, enter the required file name extension in the File name field, e.g., "Image.bmp", to save an image as a bitmap, or "Tab.xls" to save a sheet as an Excel file.
- ► The current document title will be suggested as the file name, together with the standard file format, which would mean for example "Tab2" for a sheet.

8) Click the Insert button
   - ► The document will be saved and the insertion mask opened for the next document - repeatedly, until all documents have been filed.

9) If necessary, expand the database folder in the tree structure in which you have inserted the documents.
   To do this, doubleclick on the name of the database folder or click on the plus character in the tree structure nodes.
   - ► All inserted documents are listed under the record in the tree structure.
   - ► Each type of document is identified by its own icon.
   - ► The gallery view shows all records which are below the marked tree entry. Your image analysis program creates a thumbnail preview for diagrams. The other types of documents are represented by icons.

   - ► The record name is used to label the thumbnails in the gallery view. To change the record name for documents, select the Database > Edit Record... command.

Inserting documents



Work in the database window

Arrange Fields

Background Information

Image data type All images which have been loaded into the image manager represent a data type of their own. This means that you can define special database fields for images, e.g., the "Microscope type" database field. These database fields contain information about the images and can also be used for search purposes. For example, you could find all of the light microscopic images in the database.

Graph data type For some program versions the image manager provides a third tab which contains storage for graphs. Graphs are measurement curves which are displayed in a separate document window. In the same way as for images you can create database field especially for graphs. You insert graphs into the database from the image manager using drag & drop. Remember that you can insert graphs as records (by drag & drop from the image manager) and also as documents (Database > Insert > Documents...). You should always try to insert graphs as records, because only then can you define database fields and thumbnail is available in the gallery view.

Data data type You can insert a data record into a database folder which is not linked to a document. You can use this possibility, for example to improve on the structure of the data within a database folder: e.g., several investigation methods have been used for an order, but they must all be described by their own record. Under each investigation method you can now insert the investigation results, images or sheets.

Step-by-step

Arranging data base fields

Arrange the organizational field "Customer" so that the customer is displayed in the form view for all types of data.
When an image is inserted, the customer should be displayed as information in the insertion mask.

1) Select the Database > View > Arrange Fields... command.
   - ► You will find in the View/Type list in the Arrange Fields dialog box all the contexts in which database fields can be displayed.
   - • Remember that user-defined database fields are not automatically visible in every view, but must be explicitly arranged. One exception is the insertion mask. User defined database fields are adopted automatically into the insertion mask.
     Remember that organizational fields only appear automatically in the insertion mask when a new database folder is created. If the information from the organizational fields is also to be displayed when inserting images, graphs and documents into a database folder, then you must arrange the organizational fields explicitly for the insertion mask.
2) Extend the display of Form View.
   To do this, doubleclick for example on the Form View entry or click on the plus character in front of it.

- You can adopt different database fields into the form view for the <Folder names>, Image, Graph, Document and Data data types.
  The <Folder name> is different for each database and reflects the organizational ID of your database.

3) Mark the database folder. In a project database, the database folder is called for example, "Project".
   ➤ The Available and Current list display all organizational fields which relate to all the information within the database folder. The required fields are formatted in bold type.
4) Mark the "Customer" entry in the Available list and click the Add>> button.
5) Doubleclick on the Form View entry in the View/Type list to display the data types for the form view.
6) Mark the Form View > Image data type.
   ➤ The Available and Current lists now contain all existing database fields.
7) Mark the "Customer" entry in the Available list and click the Add>> button.
8) Repeat the last two steps for all types of data.
   ➤ The customer will now always be displayed in the form view.
9) Now mark the Insert view and the Image data type.
10) Transfer, if required, the Customer organizational field from the Available list into the Current list.
    ➤ The customer will now be displayed in the insertion mask when an image is inserted.
11) Close the Arrange Fields dialog box by clicking OK.

How to arrange database fields for the insertion mask.

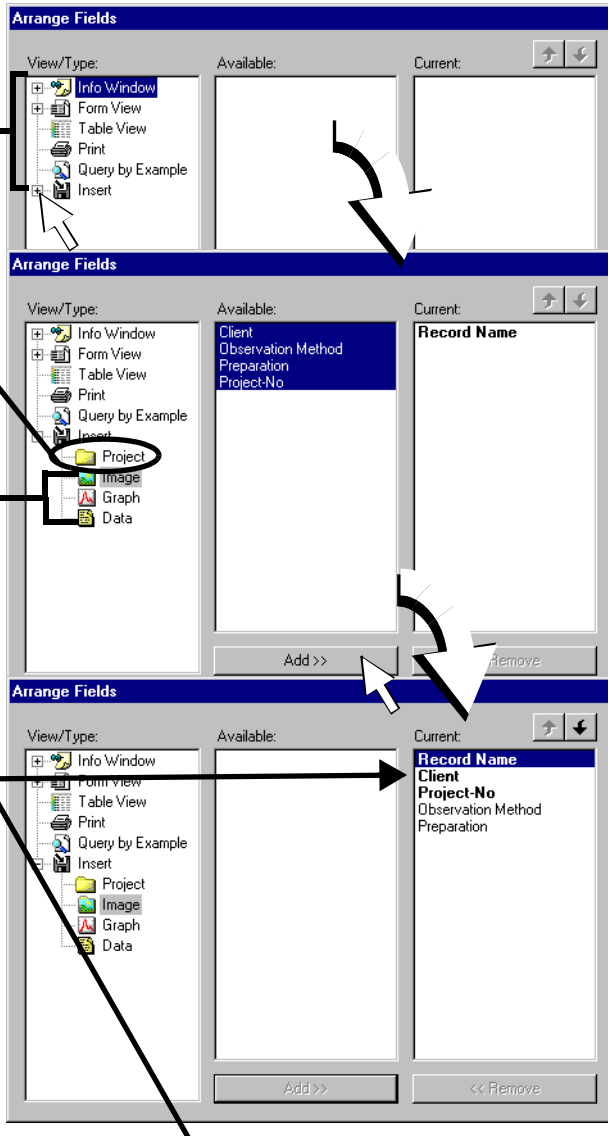
Database fields can be arranged differently for different purposes, e.g., insertions or queries.

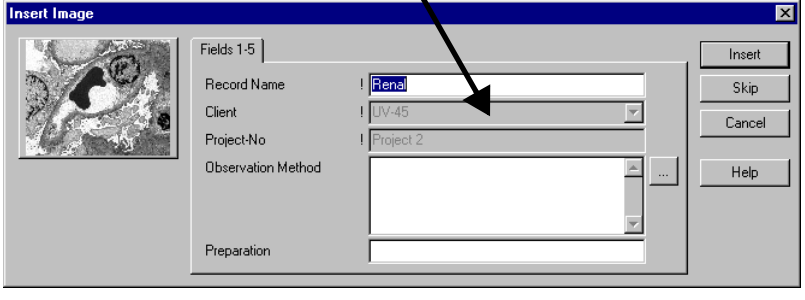
"Project" is the database´s organizational ID. For an experiment database, however, you could use the name "Experiement" rather than "Project".

Different database fields can be important for different data types.

The organizational fields are now also shown when inserting an image.

The insertion mask when inserting an image.





Choose View

Background Information

Database window Several databases can be open simultaneously. Each STAR database is represented in its own window. You can choose between different window views when working with the database:

Standard full view Normally the database window is divided into four sections. You can arrange the size of the individual sections as required: to do so, move the mouse pointer to the section edge and move it with the left mouse button depressed.

Tree structure On the lower left you will find the tree structure in which the data is arranged. The upper level is the name of the database. Below this are the main entries which are characterized by the organizational ID of the database. A maximum of three sublevels are allowed under a main entry. Each type of document is identified by its own icon. Doubleclicking on an entry extends or reduces the active level.

Preview window The record which is marked in the tree structure is displayed on the upper left. Doubleclicking on the icon in the preview window jumps up to the next higher level in the tree structure.

Form View On the lower right you will find a sheet with the columns "Field name" and "Field value". All the field information which you have selected with the Arrange Fields... command for Form View is displayed here.

Gallery View You will find the gallery view on the upper right of the database window. It shows all records which are below the marked record. A thumbnail preview is displayed for images, diagrams and graphs. The other document types are represented by icons.
Doubleclick on a record to load the record. Doubleclick on a folder symbol to open the database folder.
Records which are linked to other data are represented in the gallery by a document icon and a plus character. Click on the plus character to display the linked data in the gallery view.

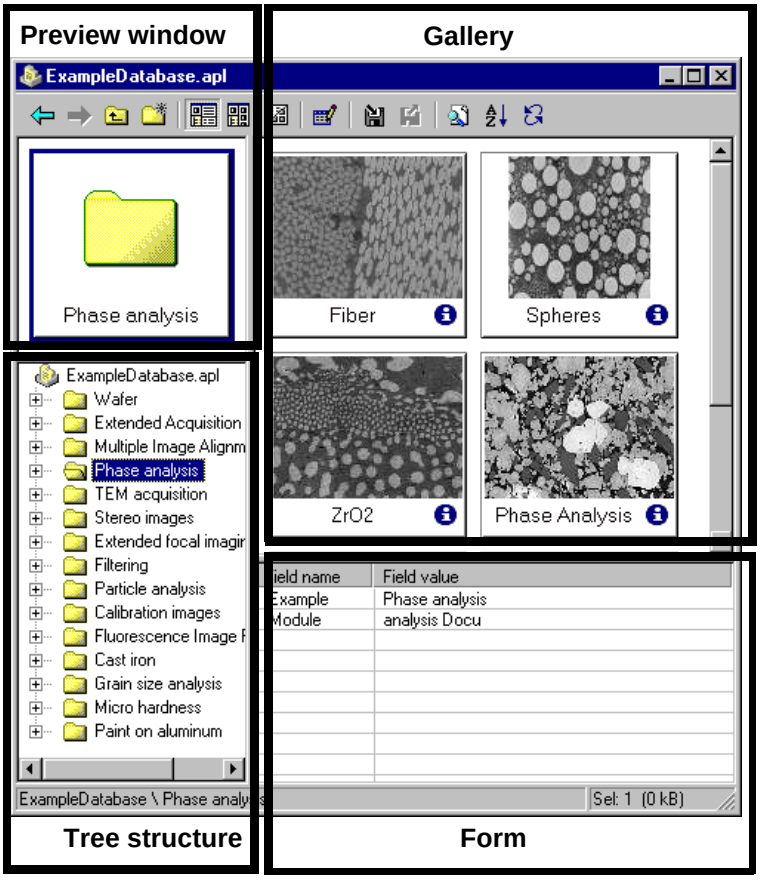
Table View If you have selected the table view, the gallery in the upper right of the database window is replaced by a sheet. All the field information that you have selected using the Arrange Fields... command for the Table View is displayed.
To switch to the table view, select the Database > View > Choose View... command.

Button bar The button bar in the database window provides fast access to frequently-used database commands.

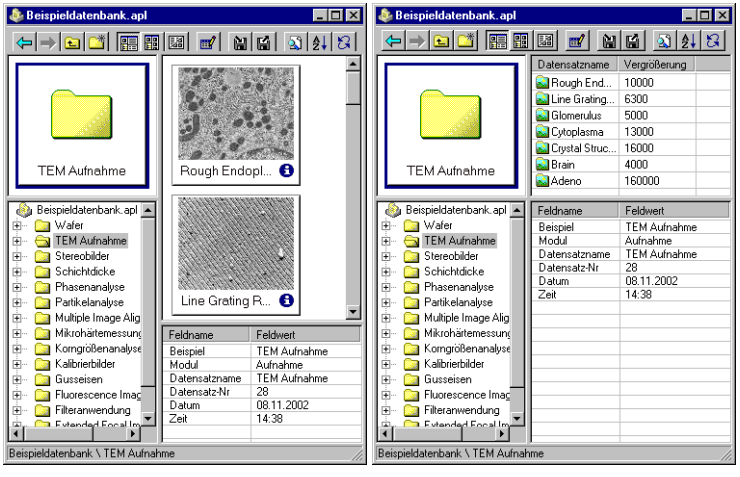
Status bar The status bar in the database window contains the names of the current record and the number of marked records.

Context menu The context menu contains frequently-used commands. You can open the menu by clicking in the database window with the right mouse button.

The button shown on the left change the database view. The database window is divided into four sections in the standard full view (button 1).



Button 1 remains depressed in full view. You can alternate between gallery view (left) and table view (right) by clicking the Next View button (3).



Step-by-step

Work in the database window

1) Open either the example database which you can install together with your image analysis program, or one of your own databases.

2) If you need space for images or reports, click in the database window button bar on the Narrow view button to reduce the database window.
   - ► Your image analysis program removes the form view and reduces the gallery to a narrow stripe.
   - ► Your image analysis program changes the size of the database window so that it takes up half of the document area. The database window is positioned on the right of the image manager.

3) If you are mainly working inside the database, click the Full view button in the database document's button bar.
   - ► Your image analysis program divides the database window into four sections.

4) In the tree structure, mark the uppermost entry with the APL file name extension.
   - ► The form contains the following information about your database. The fields shown here are predefined and cannot be edited using the Arrange Fields... command:

File Name	Name of the database
Path	Complete directory name of the apl database file
Created	Date and time of creation
Last access	Last access to the apl database file
Modified	Last modification of the apl database file
Opened exclusively	Information about the status of the database. You can only carry out operations which modify the structure of the database if the database is opened exclusively.
Read-only	Information about the status of the database. A database can, for example, be opened on a read-only basis if you have created it on a medium such as a CD-ROM.
Database identifier	Clear identification of the database: this identifier is only used internally.
Converted from mdb	contain the information on whether or not the STAR database was converted from an Archive *.mdb-database.
Database version	Version number with which the STAR database was created.

5) Mark the different database folders in the tree structure, e.g., the database folder "TEM Acquisition" in the example database.
   - ► The preview window displays the schematic database folder.
   - ► The gallery displays all records which are located one level below the database folder.
   - ► The form contains information about the selected database folder.

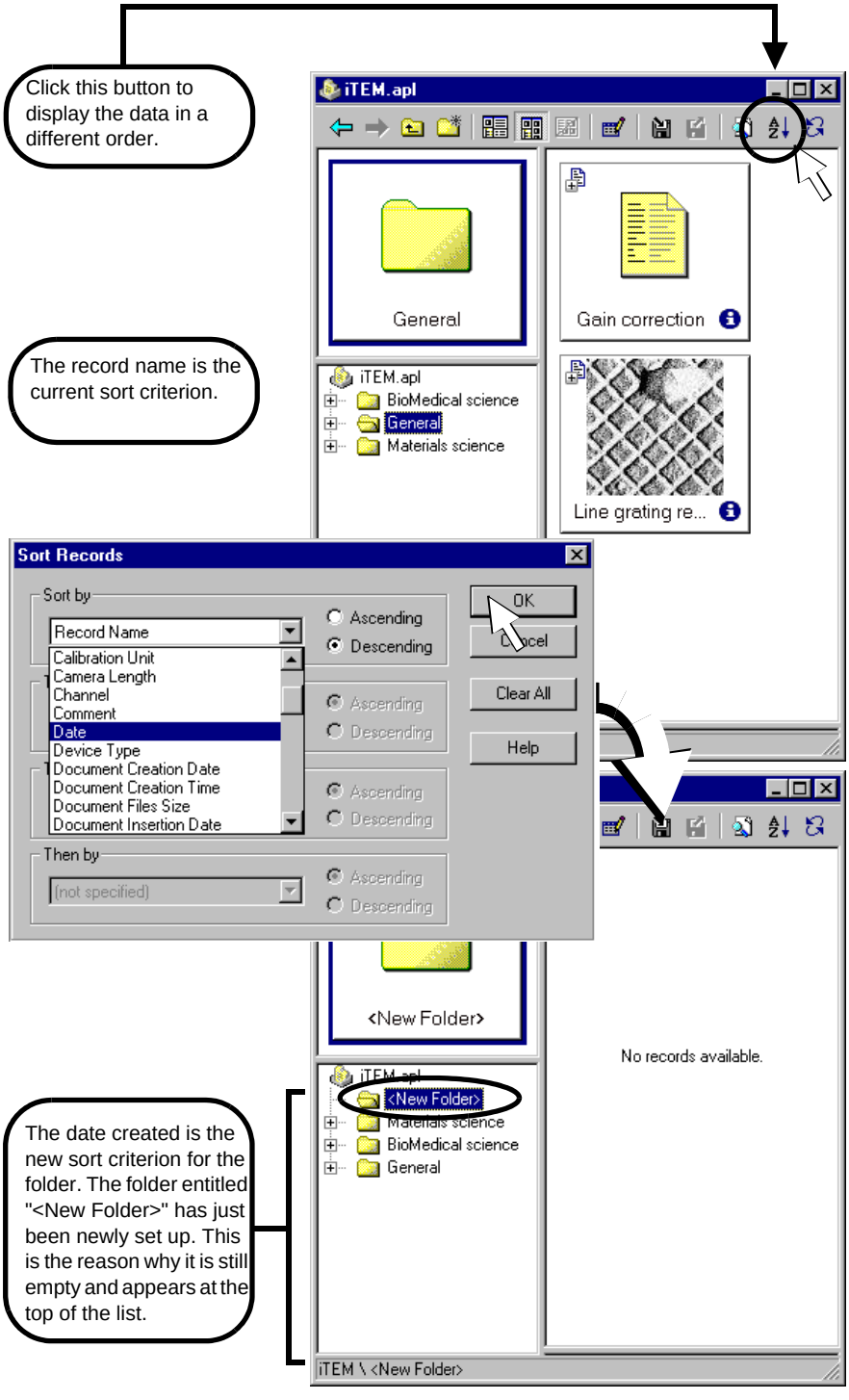
6) Mark different images in the tree structure.
   - ► The preview window shows the thumbnail of the selected image.
   - ► The gallery shows all the records which are behind the image.
   - ► The form contains information about the selected image.

How to sort your records.

Click this button to display the data in a different order.

The record name is the current sort criterion.

The date created is the new sort criterion for the folder. The folder entitled "<New Folder>" has just been newly set up. This is the reason why it is still empty and appears at the top of the list.



Step-by-step

Changing the view of your database

1) Select the Database > View > Choose View... command.
   ► The Choose View dialog box offers 6 different displays of the database window.

Full View > Table View	A table is displayed in the full view instead of the gallery.	The database view selected under the Full View option is automatically chosen by clicking the Full View button located in the Database button bar. Click the Next View button to alternate between gallery and table views.
Full View > Gallery View	Default full view including gallery and form view	
Full view > Horizontal Gallery View	The gallery is displayed as a single row. In this way the size of the gallery section is reduced in favor of the form.	
Narrow View	The form view disappears and the gallery is reduced to a small strip. Equates to the view which is selected by clicking on the Narrow view button.	
Structure Strip	Reduces the database window to the preview window and tree structure.	
Gallery bar	Reduces the database window to the gallery view. Use the Superordinate record button in this view to move within the database. You will find the buttons in the database window button bar.	

2) Select one of the views offered and confirm by clicking OK.

Configuring and opening the info window

1) Select the Database > View > Arrange Fields... command.
2) Unfold the Info Window branch in the tree structure.
3) Mark the Image data type.
4) In the Available list, mark the user fields that you want to display in the info window and click the Add>> button.
   - Remember that you can only display a maximum of seven database fields in the info window.
   - Remember that only one line per field is displayed. Database fields of the "Memo" type are therefore of limited suitability for the info window.

5) Close the Arrange Fields dialog box by clicking OK.
6) In the gallery view, click on the info symbol on the lower right in the thumbnail.
   ► The info window opens. It shows your selection of seven fields.

7) In the info window, click the Keep visible button (with a free notice board pin) to fix the window on the database document.
   ► The button now shows a sunken notice board pin.
   - Now you can click on any thumbnails in succession in order to look at the selected fields in the info window.

8) Click on the symbol with the cross on the upper right to close the info window.

Finding data

Background Information

Database queries

Your image analysis program offers three methods of finding images in a database.

Query by Example

You can use this query for a simple search for the entry of a field. You can also link several fields using the AND link. For a query by example you can use the " * " wild-card.

Query by Example		
Search targets are ...	**Field**	**Entry**
... all records by Christian	User	Christian
... all records beginning with letters "Gold"	Record Name	Gold*
... Database folders created after 16.4.2005	Date	>16.04.2003
... all records inserted on 31.5.05 before 18.30	Document Insertion Date	31.5.2005
	Document Insertion Time	<18:30
... all images which were not acquired using the "SlowScan" logical input channel	Channel	<> SlowScan
... all images with a magnification of 200 or more	Magnification	>=200
... all sheets	file name	*.sfs

Query by Free Filter

You can use this query for a search using several search criteria which you want to connect in a complex way using AND or OR links.

Query by Free Filter					
Search targets are ...	**Field**	**C.**	**with**	**C.**	**with**
... all folders from 2008	Date	>=	1.1.2008	<	1.1.2009
... all RGB and gray-value images	Image Type	=	RGB		
	OR				
	Image Type	=	Mono		
... all image names which begin with A	image name	>=	A	<	B
... all images were inserted on the 20.5.2003 between 15.00 and 20.00	Document Insertion Date	=	20.5.2003		
	AND				
	Document Insertion Time	>=	15:00	<=	20:00

Query by SQL

This query uses the standard SQL database administration language to formulate the search criteria.

Query

You can use this button to carry out an initial query by example. For subsequent queries, you open the dialog box of the pervious query.

Save search filter

For queries by free filter and queries with SQL, you have the possibility of saving your search filter so that it may be reloaded later if required.

Representation of the query results:

- The data found is indicated in the "Query results" database folder directly under the database symbol in the tree structure.
- The "Query results" database folder is updated with the new query results for each search.
- Query results are no longer present after a new start of the program.

Step-by-step

Selecting the database fields which you need in the query mask

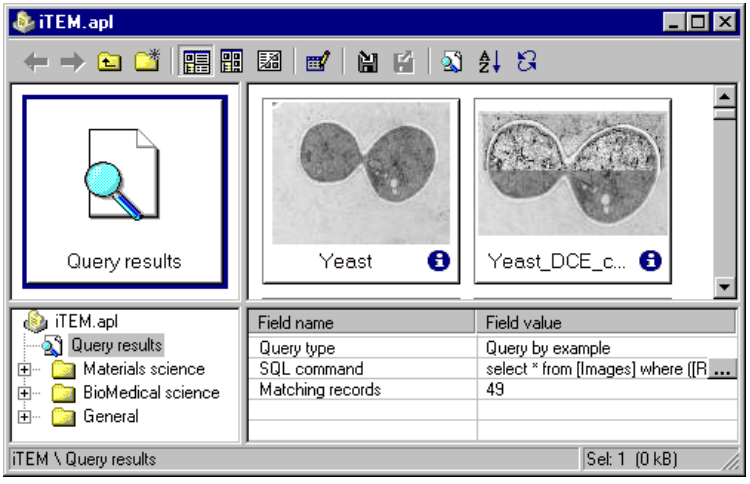
In your database there is the user-defined "User" field. You want to be able to find all the images the user "Mr. Smith" inserted into the database in 2003.

1) Select the Database > View > Arrange Fields... command.
2) Mark Query by Example in the View/Type list.
3) Select the fields in which you want to search for images, e.g., the user-defined "User" field and the predefined "Document Insertion Date" field.
4) Click OK to close the dialog box.

Searching for images in your database

1) Select the Database > Query by Example... command.
   ► The Query by Example dialog box contains the selected database fields.
2) Enter the required entries into one or more fields. For example, enter "Mr. Smith" into the "User" field and "31.12.2002" into the "Document Insertion Date" field.
   - During the query by example, fields are linked with "AND". You will only find the images which fulfill all the search criteria simultaneously.
   - The query mask offers you a selection assistant for all date fields. Click the ... button next to the date field. A dialog box with a predefined date opens. Click on the arrow to open a calendar in which you can select the date that you need.
3) Click the Advanced >> button in the query mask. Click the Unselect All button. Mark the check box in front of the Image data type to limit the search to images. Other documents will not be found.
4) Click the Search button to carry out the search.
   ► The images found will be displayed in a separate database folder with the name "Query results". The query results are displayed directly under the database icon in the tree structure.
   ► Some information about the current query is displayed in the form, for example, the number of records that have been found.
   ► The current marking jumps into the query results automatically.

The "Query results" database folder shows all the data that has been found. The form contains information about the query.



5) Use the Previous record in history button to return to the record which was marked before the query was carried out.
6) Mark the "Query results" database folder in the tree structure.
7) Mark one of the images that has been found. Click the right mouse button and select the Goto Record command from the context menu.
   ► The marking in the tree structure jumps to the database folder which contains the selected record.
8) Mark the "Query results" database folder again. Use the [Del] key to delete the search result.

Load data

Background Information

Load stored data If you have already archived part of your data on removable data media, the system searches for a data medium with a fixed name when loading. This explicit data medium name is automatically assigned by the system during filing. You will be asked to label the data medium with the name. To load the data, insert the required data medium. Then select the "DocumentFiles"- directory or click the Query button.

Integrate images in reports Use the report generator to produce professional multiple page reports (File > Report > New...). It offers layout options for the highest standard of reports. Images, documents and database fields can be easily integrated directly. You can also import values from previously-specified table boxes into a report.

Export images You can copy database images and documents as files onto any network drive at any time (Database > Export record files...). You can then edit these files using other programs and also print them out.

Step-by-step

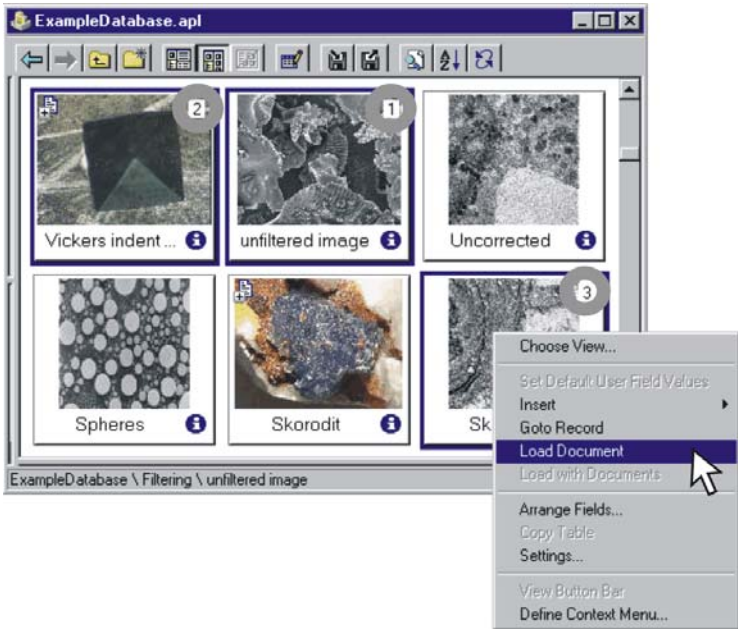
Loading an image

1) Mark an empty image buffer in the image buffer box.
2) In the database document's gallery view, doubleclick the image you want to load.
   ➤ The image is loaded into the image buffer and represented in the image window.
   • Alternatively, you can drag&drop the image, either from the gallery view or from the tree structure, onto the image buffer.
   • Please note: using these two methods will load the image, but not the documents which may be attached to them.

Loading several images in a defined order

1) If the images that you want to load are in different database folders, carry out a query to find all the required images. Search for example, for all the images which have been inserted for the projects A and B.
   ➤ All images found will be displayed in the gallery view.
2) Mark the images in the order in which you want to load them. To do this, depress the [Ctrl] key and mark the images with the left mouse button.
   ➤ All the marked images have a colored background. The numbers in the top right corner of the images represent the order of the marking.
3) Mark an empty image buffer in the image buffer box.
4) Select the Database > Load Document command.
   ➤ The marked images will be loaded into the successive image buffers of the image buffer box in the selected order. If one of the image buffers is write protected, your image analysis program stops loading at this point.
   • Please Note: images in image buffers that are not write protected will be overwritten without warning.

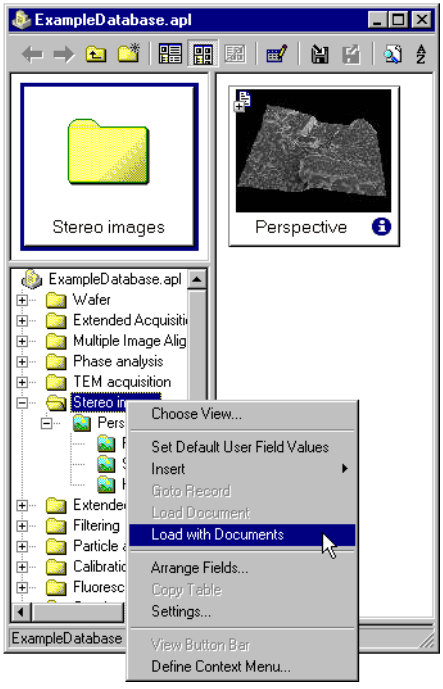
If you mark several records, the records in the gallery are numbered on the top right in the order of selection. Select the Load Document command to load all the selected images into the image manager in the order selected.



Loading all the data within a database folder

1) Mark a database folder in the tree structure.
2) Select the Database > Load Document with Subdocuments command if you want to load all the records within the database folder.
   - ► Images will be loaded one after another into the successive image buffers of the image buffer box.
   - ► Documents are opened in your image analysis program - these are for example the sheets with the SFS file name extension and the diagrams with the SFD file name extension.
   - ► Other document files are loaded in the appropriate application programs - these are for example the text files with the DOC file name extension in Word and the sheets with the XLS file name extension in Excel.

There are four images in the marked database folder. Select the Load with Documents command to load all the images into the image manager.



Archive data

Background Information

Archiving

Archiving allows you to archive older files from the current database on a CD or other data carriers. The original data are subsequently deleted from the database. You can of course continue to work with the entire database, i.e., formulate queries or insert and load data. The thumbnails of the stored records are still available. If you load a stored record, you will simply be asked to insert the appropriate storage medium.
Ony complete database folders are stored. You can lock the database folder when storing. Insertion of data into a locked database folder is then no longer possible.
Always use the wizard to secure data when archiving. Never transfer data from a database in Windows Explorer.

Temporary storage directory

This directory is used for temporary storage of the files when archiving the database. Set up the directory for the database files and the temporary storage directory in the same partition on the main drive. In this case the system checks the available space when inserting the data into the database. As soon as less space is available in the temporary storage directory than defined in the Special > Preferences > Database > Backup volume capacity, no more data can be added to the database. In this case you will be asked to archive data. To do so, select the Database > Administration > File Storage... command.

Storage

Both single images and the entire database can be deleted without too much effort. And no storage medium provides 100% data protection.
For this reason you should protect your database against unauthorized access and data loss as a result of accidental deletion or damage of the data medium:

- Protect your database with a password.

- Make backup copies at regular intervals.

Backup / Security copy

When making a backup or security copy, you copy the database data so as to use the backup to reconstruct the database in case of data loss. A backup copy must therefore be made on a regular basis so that the data is as up-to-date as possible. The original data remains unchanged in the database.
To make a backup you can either use the software wizard for file storage or the backup software which you normally use to secure data.

Warning

You should DEFINITELY make backups of your database at regular intervals.

Select the Database > Administration > Restore Database Backup command to use the backup when restoring individual database folders following data loss.

Database wizard

Use the Database > Administration > File Storage... command to activate the database wizard. The wizard guides you step-by-step through the backup and the archiving procedures.

CD / DVD-Burner

It is possible to access a CD or DVD burner directly from your image analysis program. The "Nero Burning ROM" software is a prerequisite for this. Please note the following points:

- Due to data security, data will be written to the temporary backup directory when saving or archiving data. Even when directly accessing CD or DVD burners, you still require available storage capacity. The required size of the available storage is equivalent to the capacity of the CD or DVD. During file storage, the system automatically checks if there is enough storage space on the drive for the temporary backup directory.
- The database files with the APL, MTB and TNB file name extensions are always burned on a separate medium, even if there would be enough space on the CD. The reason for this is these database files must once again be modified after executing a successful burning procedure.
- Due to file security, your image analysis program does not support the "Multi-session" functionality from the burner software. You cannot write anymore additional files to a CD or DVD after a successful burning.

Step-by-step

Creating a backup copy of your database

The backup is to be written directly to the CD / DVD.

System requirements

You have access to a CD / DVD burner. You have "Nero Burning ROM" software.

1) Check the settings for the temporary backup directory: Use the Special > Preferences... command. Select the path to which the data is going to be temporarily stored to from the Temporary storage directory field located in the Database tab.

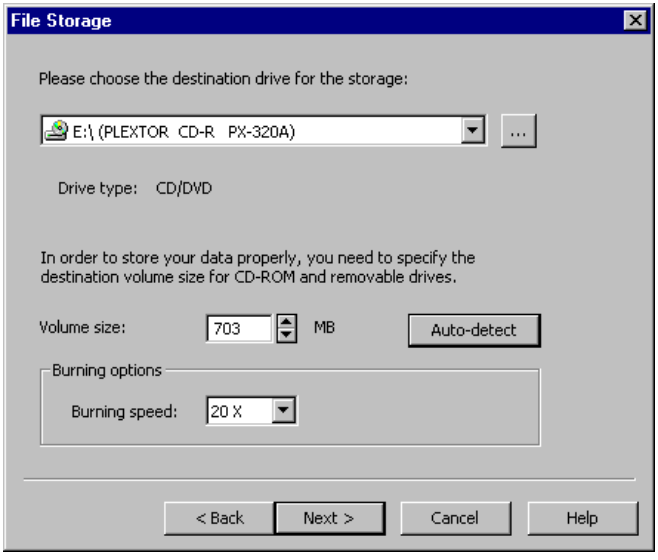
   - Please note: There must be sufficient space for burning in the directory to which the temporary backup directory has been stored.
2) Check the directory name under which the database files of the database are stored. To do this, select the upper most entry in the database's tree structure located in the database window. The database path is shown in the form in the lower right.
3) Place an empty CD or DVD in the burner.
4) Use the Database > Administration > File Storage... command to call up the file storage wizard.

5) Select Backup.
Click the Next > button.

6) Select the database you want to backup. To do this, enter the path name of the database in the field or click the ... button to select the directory.
Click the Next > button.

7) Select the destination drive for the backup. Your CD / DVD drive is explicitly shown in the list.
   - Please note: Select the burner from the list! If you click the ... button and select the burner via Select Directory you will get an error message.

You can directly access CD / DVD burners directly from your image analysis software. In this case, the burner is going to be shown as an individual entry in the list of destination drives.



8) Click the Auto-detect button to automatically detect the size of the destination drive.
   ► The available burning speeds will be selected together with the size of the destination drive.

9) For security reasons, do not select the maximum burning speed, but stay one level below it. This reduces the possibility of errors.

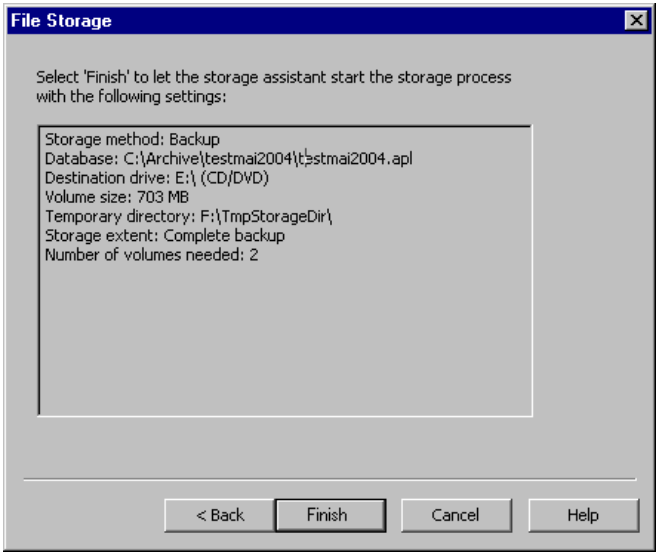
10) Click the Next > button.

11) Select the scope the backup is to have. Select the incremental backup option, for example.
   - Please note: You can save all the database files, or only those which have been altered since the last backup.
     If you save all the database files, the files with the APL, MTB and TNB file name extensions are always written to an individual CD / DVD.
     If you only save altered database files, clear the include database files check box to abstain from saving the database files. Then, you should save the database files in another manner.

12) Click the Next > button.
   ► The system now calculates the number of data media required.

13) Before starting the backup, carefully check the data in the File Storage dialog box.

Before starting the backup, you will get important information about the backup process.
Please note that you require at least two data mediums if you want to save all of the database files.



14) Click the Finish button to begin the backup.
   - ► Your image analysis program copies all of the records for the first CD or DVD first to the backup directory and then starts the burning software.
   - ► Your image analysis program checks to see if the files were properly burned. The test can take some time based on the drive, because it is checked bit by bit.
     After the test has successfully been completed, you will be asked to remove the CD and to label it with the provided identifier.
   - ► After the test has successfully been completed, your image analysis program deletes the files from the temporary backup directory to create space for the next CD's files.

15) Label the CD accordingly!

16) Insert the next empty data medium and follow the database wizard's directions.

Archiving files on CD

You have created the database on your local PC. You need space on your hard disk and want to export older files from your database.

System requirements

You have access to a CD / DVD burner. You have "Nero Burning ROM" software.

1) Check the settings for the temporary backup directory: Use the Special > Preferences... command. Select the path to which the data is going to be temporarily stored to from the Temporary storage directory field located in the Database tab.

2) Check the directory name under which the database files of the database are stored. To do this, select the upper most entry in the database's tree structure located in the database window. The database path is shown in the form in the lower right.

3) Close the database from which you want to archive files. Make sure that no other user is using the database.

4) Use the Database > Administration > File Storage... command to call up the file storage wizard.

5) Select the Archiving of Documents option.
Select the Lock archived records check box. In this case, you can no longer store any more files in closed database folders after archiving.
Click the Next > button.

6) Select the database you want to backup. To do this, enter the path name of the database in the field or click the [...] button to select the directory.
Click the Next > button.

7) Select your CD / DVD drive from the list. Then, click the Auto-detect button to automatically select the size of the destination drive.

8) Click the Next > button.

9) You will get a list of all of the database folders of the database which have not yet been archived or which have been altered after the last archiving. Select all the database folders which you would like to archive. These should be finished procedures. To do so, use the operating systems default key stroke:
[Ctrl] key + left mouse button selects single records,
[Shift] key + left mouse button selects a row of records,
[Ctrl + A] selects all of the records.
Click the Next > button.

10) Before starting archiving, carefully check the data in the File Storage dialog box.

11) Click the Finish button to begin archiving.

12) Follow the instructions of the database wizard.
    - ► After successful archiving, all of the archived records are marked by a lock in the database window.

The table shows icons used to identify records within the database window's tree structure.

	read-only record No data can be inserted into this folder.
	archived record Additional data can still be inserted underneath this record.
	archived and read-only record No additional data can be inserted into this folder. The folder was locked during archiving.

Protect with a password

Background Information

Database password

You can assign different passwords for every database. The database password protects the entire database against unauthorized access. The database cannot be opened by a user who does not know the password. Remember however, that a database password does not protect against access or manipulations through Windows Explorer.
Make a note of the password and store it. If you forget the password you will no longer be able to access the password-protected database. Even the vendor of the database has no possibility of accessing the database without knowing the password.

Session password

A session password is not related to a single database, but to a workstation. Assign a password to prevent unintended and unauthorized manipulation of the structure of your databases. All commands which affect the structure of the database are only available to the user who knows the session password for the software version. The commands are deactivated for all other users. The insertion and loading of data and all queries for a database with session password is also permitted for every user who can open the database.
The following commands are deactivated when the database is opened without the session password:

- **Export record files...**
- **Database > View > Arrange Fields...**
- All commands in the Database > Administration menu, apart from the Logon... command.

Warning

Make a note of your database password.

You can limit the number of records that can be deleted in any one process in the Database > Administration > Database Settings dialog box.

Step-by-step

Defining a session password

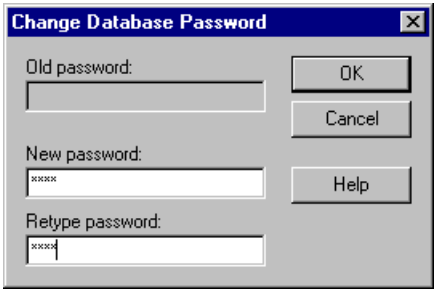
1) Select the Database > Administration > Change Session Password... command.
2) Enter a password in the Password field. Remember which characters are upper/lower case.
3) Retype the password in the Confirm Password field.
4) Confirm the session password by clicking OK.
5) Select the Database > Administration > Logoff command.
   ► The commands for changing the database structure are now gray.

6) Select the Database > Administration > Logon... command if you want to release disabled commands.

Assigning a password to the database

1) Open the database exclusively.
   - To do so, mark the Exclusive check box in the Open Database dialog box.
2) If the database is protected by a password, select the Database > Administration > Logon... command and enter the session password.
   ➤ The Database > Administration > Change Database Password... command is available.
3) Select the Database > Administration > Change Database Password... command.
   ➤ You will receive a warning that the database is lost if you forget the password.
   ➤ The Change Database Password dialog box opens.
4) Enter your password in the New Password field.
   - You can enter up to 14 characters.
   - The system is upper and lower case sensitive.
5) Retype your password in the Retype password field.
   ➤ The OK button is activated.
6) Confirm the password by clicking OK.
   - In future you can only open the database by using the correct password.

Use the Database > Administration > Change Database Password... command to protect your database with a password. It can have up to 14 characters. For security reasons you have to enter the password twice consecutively - a special character appears for each character.
The command is only available when the database is opened exclusively.



Processing images

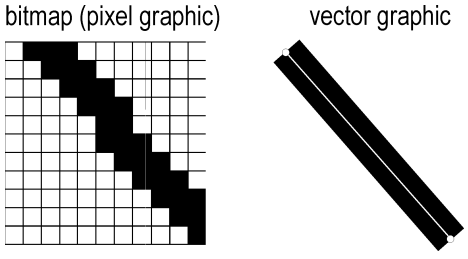
Editing overlay

Background Information

Overlays Overlays contain labels, highlighters (e. g., an arrow) or graphics (e. g., your company logo). Many image analysis functions write measurement results in the overlay as well. Overlays are placed over images like an overhead transparency. The image information beneath the overlay remains unaffected. If you save an image along with its overlay in the TIF format, image and overlay will remain separate.

Bitmap and vector graphic Graphic data can be saved/managed using various methods: a bitmap consists of single pixels, a vector graphic of mathematically describable curves. A line is described via its initial and terminal points.

The figure shows a pixel line and a vector line (greatly-magnified). The overlay is a vector graphic. An image is made up of single pixels.

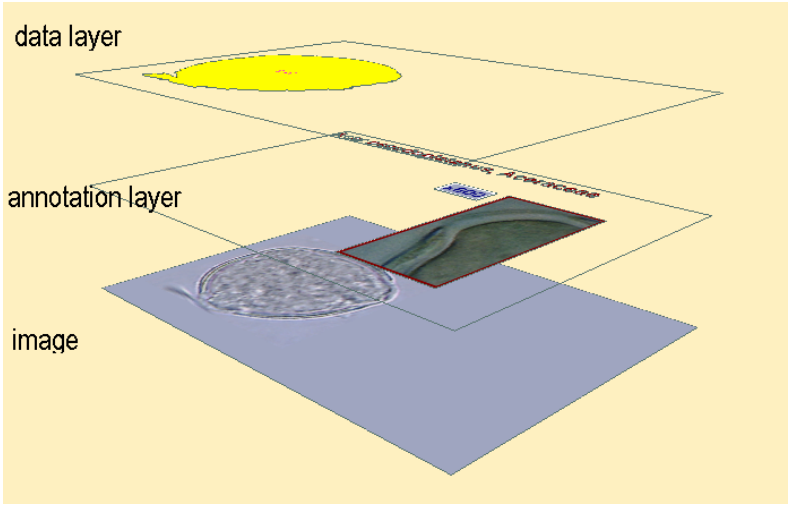


Overlay Layers Overlay objects may be arranged in different layers. Think of these layers as if they were several transparencies which are placed over the image. Each transparency, i.e., overlay layer, may contain objects.

Annotation layer The annotation layer contains all objects inserted using the overlay button bar functions.

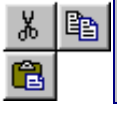
Data layer The data layer contains all information that your image analysis program automatically writes into the image overlay for: interactive measurements, automatic particle detection, or for histogram calculation. The standard setting has this overlay layer locked, i.e., you cannot select, move, or delete an object from the data layer.

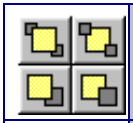
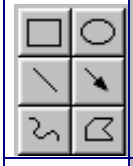
You can label images in an overlay without overwriting image information because the overlay is simply placed over the image like a transparency. Your image analysis program uses multiple overlay layers for different kinds of information. The data layer is reserved for automatic overlays, which are generated by measurement operations. Use the annotation layer to label your images.



Overlay button bar

The Overlay Button Bar button shows/hides the Overlay button bar. You will find the button in the standard button bar. The entire range of overlay functions is available via this button bar only. It contains a broad variety of tools for making your overlay as you like it.

	Button	description
	Edit Overlay	switches you into the edit-object mode for overlay objects. The edit-object mode is for selecting, moving and editing overlay objects. This button is only available if at least one overlay object is present.
	Select All	selects all overlay objects in the active image. This button is only available if *no* objects have been selected in the overlay.
	Select None	cancels all current selections. This button is only available if overlay objects have been selected.
	Object Properties	is for setting object properties. The properties which are available will depend on the type of overlay object selected.
	Layer	opens a multiple-function submenu for dealing with overlay layers. You can make overlay layers appear or disappear. Overlay layers containing automatically-generated measurement data can be protected from unintentional alterations.
	Burn Overlay	writes the overlay of the active image buffer irreversibly into the image. All image information beneath the overlay will be overwritten.
	Delete Layers	deletes all objects of the overlay layers currently being shown.
	Load Objects	loads bitmaps, icons, metafiles or complete overlays from an existing file into the overlay of the active image.
	Save Objects	saves all selected overlay objects to an overlay file.
	Cut Objects Copy Objects Paste Objects	copies selected overlay objects from one image into another, or within the same image. Please note that overlay objects cannot be copied using the Windows clipboard.

	Bring to Front, Send to Back, Bring Forward, Send Backward	arranges overlay objects in the order desired - in front of, behind, etc. Arranging overlay objects is only possible for overlay objects that are on the same layer.
	Text	for inserting a text object.
	Rectangle Ellipse Line Arrow Polyline Polygon	for inserting various graphic objects into the overlay.
	Highlighter	for highlighting any rectangular image area in color. The highlighted image segment looks like a color transparency has been placed over the image area.

Burning Overlays

Burning an overlay writes the overlay information into the image, thus overwriting image information. The burning of an overlay is not necessary for any application within your image analysis program.
Burning an overlay is necessary, e. g., when you wish to export an image along with its overlay into another application program such as MS Word. This is the only way for the other application program to be able to process the overlay information.

Please Note:

Edit-Object mode
An overlay object must be selected for most overlay operations. You can only do this if the mouse pointer is within the image window. Click on the white arrow button of the Overlay button bar to get into the edit-object mode.

Delete selections
A selection is usually only removed if you explicitly cancel it. To cancel all selections, you can click on the button with the red 'X', for example.

Font size
You can choose one of two options for dealing with font size in the overlay. This setting is also taken into consideration when printing:

- You can have your text zoomed along with the image, thus ensuring that text size matches image display size. If you display the image in the viewport at a lesser zoom level, text size will be reduced accordingly. The Object Properties > Text > Zoom with image check box is selected in this case.
- For zoom levels less than 100%, you can have the text displayed at a constant size. The Object Properties > Text > Zoom with image check box is not selected in this case.

Locked Data Layer
The default setting has data layers locked. This means that objects in a data layer can*not* be selected or edited.

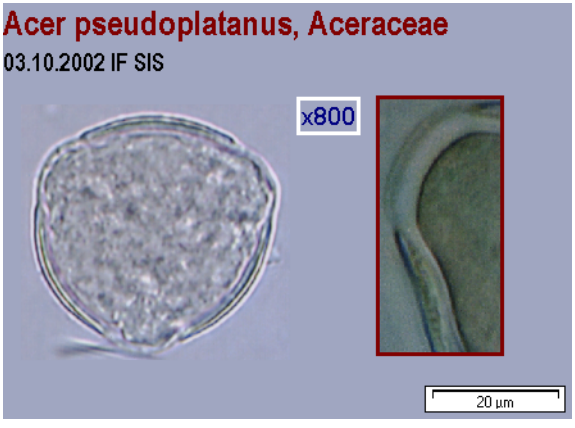
Overlay Clipboard
To copy an overlay, use the buttons of the Overlay button bar; you cannot use the Windows clipboard. Instead of pressing [Ctrl+c], and then [Ctrl+v], you use the buttons in the Overlay button bar.

Step-by-step

Inserting and formatting texts

1) Click the Overlay Button Bar button in the standard button bar to open the button bar containing the overlay functions.
   ➤ The Overlay Button Bar button will appear ‘pressed’ as long as the overlay button bar is being displayed.

2) Click the Text button to insert a text object.
   ➤ A rectangle will appear in the overlay.
3) Use the mouse to determine the size and position of the text object. Rightclick to have the text object transferred to the overlay.
   ➤ The Object Properties dialog box will open.
4) Enter your own text in place of the < New text > default entry in the Text tab.
   • Text within an overlay object can be altered at any time via the Object Properties button.
5) Select the Autosize bound check box to have text-object size adjusted to fit the length of your text.
6) Select the Zoom with image check box. This makes sure the text size is always adjusted to whatever zoom level the image is at onscreen.
7) Determine font, font size, style and color in the Font tab.
8) Define the background and text-frame color in the Colors and Lines tab.
9) Click on the OK button to close the dialog box.
   ➤ The text in the overlay will be altered accordingly. The width of the text object will be adjusted to fit the size of the text. The selection markers are gray. When gray, this indicates that the overlay object has an automatic frame, meaning frame size cannot be interactively altered.
   ➤ The newly-inserted text object remains selected within the image.



The overlay of this image consists of 4 overlay objects: three text objects of varying formats and a bitmap object on the right. All overlay objects are on the annotation layer. The dynamic scale bar is not an overlay object.

Inserting and formatting arrows

1) Click the Arrow button.
2) Leftclick to define the initial and terminal points of the arrow in the image window.

- ► Any and all current selections will be canceled.
  Your image analysis program will insert the arrow - selected - into the overlay.
  The arrow's initial appearance upon insertion is determined.

3) Click the Object Properties button to format the arrow: you decide the arrow's color, type of line, line weight and arrow style.
4) Click the Apply button to assign the arrow the properties selected.
5) Once satisfied with your arrow's appearance, close the dialog box via Close.

Loading any bitmap into the overlay

1) Click the Load Objects button.
   - ► The standard dialog box for loading files will be opened. The Files of type list provides you with a number of image file formats to choose from: BMP, ICO, EMF along with the file format for overlay files OVL.
2) Select the Windows bitmap (*.BMP) entry. Select the bitmap desired and click the Open button. This might be, e. g., your company logo or a comparison image.
   In the installation directory of your image analysis program you will find samples of all supported file types (in the "Overlay" subdirectory).
   - ► A rectangle the size of the bitmap will be displayed in the overlay. Position the rectangle as you like, and rightclick to have it transferred to the overlay.

3) Click the Object Properties button to frame the bitmap, or have one of its colors changed.
4) Should you want to hide a color: Select a color that occurs in the bitmap in the Keying color palette and then select Transparent in the Background palette.
5) Click OK to close the dialog box.
6) The color selected will no longer be displayed. The bitmap will be transparent where the color selected had been; the original image shows through.

Saving and reloading overlays

1) Click the Select All button.
   - ► All overlay objects will appear surrounded by selection markers.

2) To save the selected overlay objects to a file, click the Save Objects button in the Overlay button bar.
3) Issue a name for the overlay in the Save As dialog box and click the Save button.
   - ► The entire overlay - consisting of text, arrow and bitmap - will be saved to an OVL file.

Editing existing overlay objects

1) Click the Edit Overlay button to alter the properties of an existing overlay object.
   - ► The mouse pointer will appear within the image.
2) Doubleclick on the overlay object you wish to edit.
   - • Doubleclicking on an object will open the Object Properties dialog box.
   - ► The overlay object selected will have selection markers around it.
3) Edit the overlay object as desired and click on OK to close the dialog box.
   - • The functions offered in the Object Properties dialog box will depend on the object you select.

- You can only edit one overlay object at a time, i.e., the Object Properties function is only available when precisely one overlay object has been selected.

Increasing image contrast

Background Information

What is contrast?

Gray-value images have a maximum number of different brightness levels, e. g., 8 bits corresponds to 256 possible gray values. In many images, however, pixel brightness varies only within a small range, i.e., the actual range of gray values is less than the entire range of available gray values (0-255). Structures in such images are hard to tell apart because image contrast is minimal. To optimize the image for the viewer, spread the pixels' gray values to cover the maximum range, thus increasing image contrast.

What are contrast operations?

Contrast operations are where each gray value is transferred to a new gray value via a function: i.e., the new gray value assigned a pixel depends singularly on its original gray value. Therefore, contrast operations are local image operations. Filters are not. Filters include the gray values of neighboring pixels to compute a pixel's new gray value.
Contrast operations are so you can improve image quality in low-contrast images. Contrast can be increased within separate brightness ranges, thus making structures visible which were unclear in the original image. Image structures of similar brightness can be accentuated or suppressed as desired.

What is a histogram?

A histogram is an x/y graph which shows the number of pixels versus the gray values. It shows you which gray values occur within an image and their distribution. Peaks indicate gray values which occur frequently. The histogram is another way the result of a contrast operation can be checked (in addition to simply seeing what the image looks like).

Step-by-step

Increasing contrast

1) Load an image with a weak image contrast into image buffer 1.

2) Click the Image (button bar) > Arrange Viewports button. Select a 1x4 viewport arrangement. Then you can compare the original image with images showing the results of various contrast operations. Maximize the image window to full size.

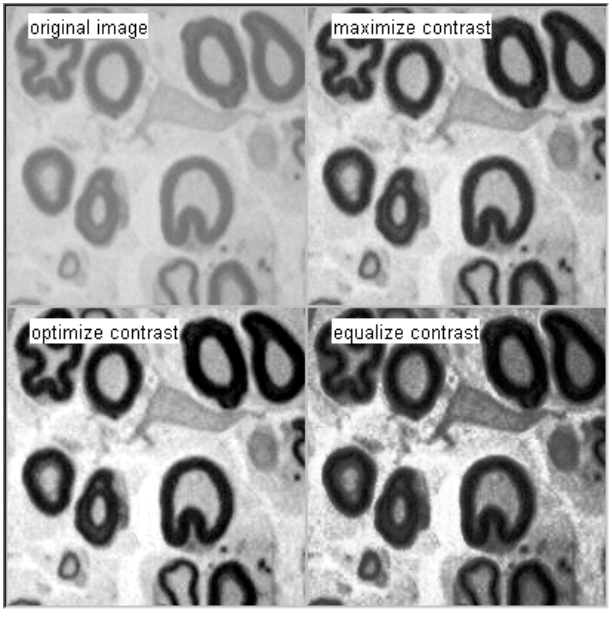
3) Set image buffer 2 to be your destination image buffer. This is done by dragging and dropping the image buffer onto the "Dest" folder icon in the operands box.

4) Select the Oper > Intensity > Maximize Contrast command.
   - ► The resulting image is written into the destination image buffer.
   - This command transfers the actual gray values onto the maximum gray-value range. Contrast is only increased if the image does not have any black pixels and any white pixels.

5) Activate image buffer 1. Set image buffer 3 to be your destination image buffer. Select the Oper > Intensity > Optimize Contrast command.

- This command extracts 3% of the darkest and brightest pixels from the histogram and makes them either black or white. The remaining histogram is then spread to cover the maximum gray-value range.

6) Activate image buffer 1. Set image buffer 4 to be your destination image buffer. Select the Oper > Intensity > Equalize Contrast command.
   - This command assigns new gray values to the pixels of the image to have all gray values occur about equally frequently; any gray value that occurs frequently will be spread out over more gray values. This makes structures visible within image areas that have similar brightness.



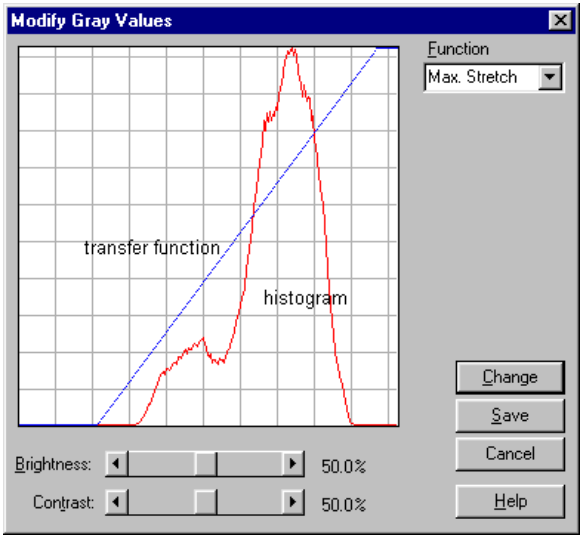
*The original image and the results of various contrast operations: **maximizing contrast** means that existing gray values are transferred to cover the maximum gray-value range. **Optimizing contrast** makes 3% of the darkest and brightest pixels either black or white and spreads the resulting histogram to cover the maximum gray-value range. **Equalizing contrast** means that existing gray values are spread out evenly to cover the entire gray-value range.*

Adjusting contrast arbitrarily

1) Load the image and set the destination image buffer. Click the Image (button bar) > Single View button to see all contrast adjustments at optimal size within the original image.
2) Select the Oper > Intensity > Modify Gray Values command.
   - ► The Modify Gray Values dialog box shows a histogram of the image (red) and a transfer function (blue). Linear transfer is the default. The image remains unchanged.
   - Any contrast adjustments you make appear within the image immediately.
3) Adjusting contrast and intensity: e. g., slide the Contrast slide control to the right. You will see how the image changes as its contrast is increased.
4) Now load one of the transfer functions in the Function list.
   - "Square Root" and "Logarithm" increase contrast in the dark image areas and lessen contrast in the bright ones. "Square" and "Exponential" do the opposite.
5) Defining your own transfer function: draw the function by hand. The curve is drawn by moving the mouse pointer across the x/y diagram while pressing the left mouse button.
6) Once you have optimized the image as desired click the Change button.

► The resulting image is written into the destination image buffer.

The dialog box shows the histogram of the original image. The original image only contains some of all possible gray values. The (existing) gray values range from 100 - 230. The transfer function shown is Max. Stretch. This corresponds to what the Maximize Contrast command does. This function stretches the existing gray values to cover the maximum gray-value range (0 - 255).



Adjusting image color

Background Information

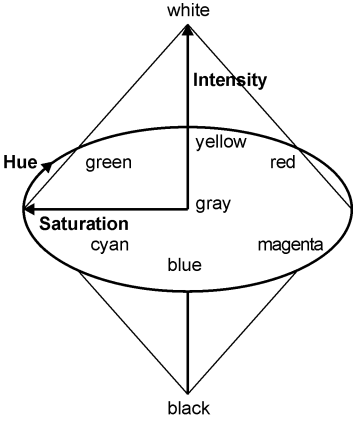
RGB: stands for red-green-blue

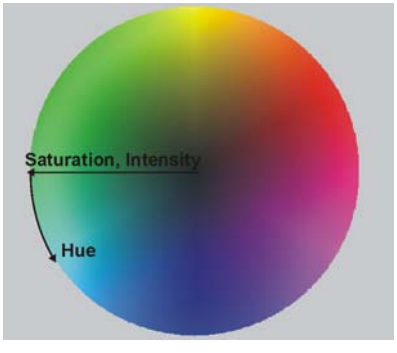
The RGB model is a model used for describing colors generated additively - as is the case on a monitor screen. RGB images are also referred to as true-color image and can contain up to 16 777 216 (=256 x 256 x 256) different colors via the additive mixing of the three primary colors red, green and blue. If all color components are at zero, the image will be black; mixing 100% of the three primary color produces white.

HSI

HSI is another model for describing color values. HSI is an abbreviation for Hue, Saturation and Intensity. HSI values of a color originate from RGB values via coordinate transformation. The HSI model is easier to understand than the RGB model because its parameters are more in line with one's own intuitive description of a color.

The HSI color space can be shown mathematically by a double clicking. The central axis is the intensity, the distance from the axis is the saturation and the angle corresponds to the hue. The color wheel is a two dimensional projection of the HSI color space. The color changes with the angle. The saturation increases towards the outer limits.





Gamma correction

Gamma correction increases or reduces image contrast selectively dependent on intensity values:

$$I(E) = I(A)^{1/\gamma}$$

where I(R) is the intensity value of the resulting image; I(O) the intensity value of the original image.

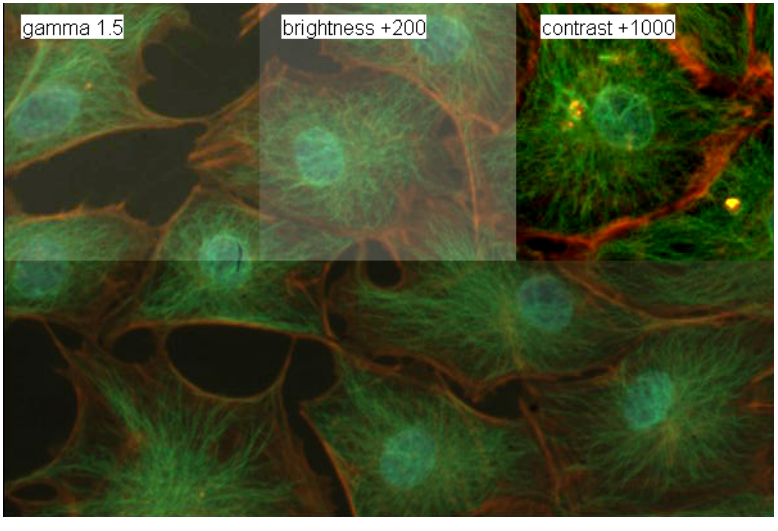
A $\gamma < 1$ gamma value darkens the image as a whole. Contrast of bright image areas is increased. A $\gamma > 1$ gamma value brightens the image as a whole. Contrast of dark image areas is increased. A $\gamma < 1$ gamma value does not change the image in any way.

Define RGB Adjustment

The Oper menu has a submenu called Adjust Colors containing commands for correcting false color and intensity within images. The different commands function the same way in principle: For example, the Oper > Adjust Color > Define RGB Adjustment dialog box provides slide controls and a field for each of the three color components (red, green, blue). Slide controls are for fast, less precise adjustment of color values. Once you have approximate values, use the fields to fine-tune the settings - entries can be made manually directly into the field, or click on the arrow keys.
DEFAULT SETTING: when you open the dialog box the parameters of the most recently-conducted color adjustment appear as the default setting.

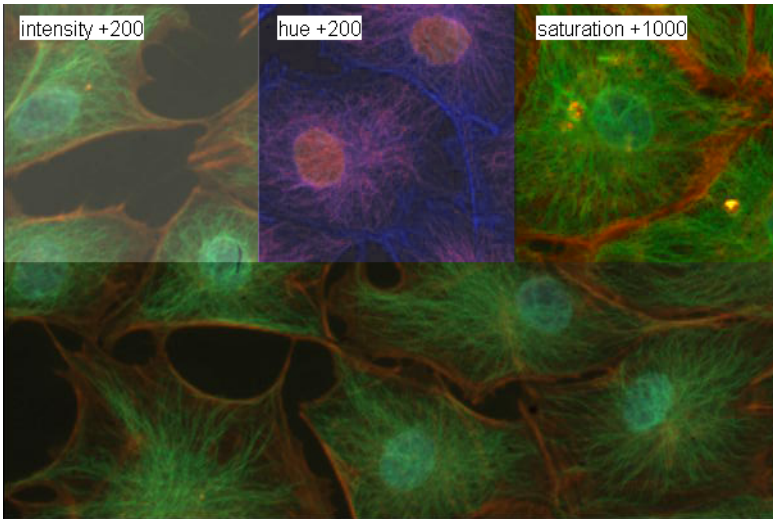
The table below shows what parameters can be adjusted. The range of available values is defined by the lowest and greatest value. The middle value means the image remains unchanged.

command	parameter	value range		
Intensity Adjustment	Gamma	0.1	1	10
	Brightness	-1000	0	1000
	Contrast	-1000	0	1000
HSI Adjustment	Intensity	-1000	0	1000
	Hue	-360	0	360
	Saturation	-1000	0	1000
RGB Adjustment	Red	-255	0	255
	Green	-255	0	255
	Blue	-255	0	255



Intensity Adjustment: *The gamma, brightness and contrast parameters have been adjusted in the above image areas.*
***left**: Gamma > 1 means the image is brightened and contrast in dark image areas is increased.*
***center:** Brightness (+200) means that intensity is increased. Color values remain constant.*
***right**: Contrast (+1000) mainly raises color saturation. Color values remain unchanged.*

***HSI Adjustment**: The parameter intensity, hue and saturation have changed in the top part of the image.*
***left**: Intensity (+200) increases brightness.*
***center**: A mid value (ca. ±200) results in a maximum change in color. A maximum value of ±360 results in the original image. Negative and positive values cause the same kind of color change.*
***right**: Saturation (+1000) is maximum.*



Step-by-step

Adjusting colors (RGB)

1) Select the Oper > Adjust Colors > Define RGB Adjustment... command to adjust the red, green and blue components of the active image.
2) Select the Preview check box to be able to watch alterations as they occur within the image. Click the Window button to define an arbitrary rectangular area within the image for the preview.
   - The preview window is only relevant while you define color adjustment. When the defined color adjustment is conducted, colors are adjusted for the entire image, or if a frame has been set, to the area within the frame.
   - The first time you start up the default setting for the preview is for the whole image.
3) Defining color-adjustment parameters:
   - Move one of the slide controls to the left to reduce that color within the image.
   - Move a slide controls to the right to increase that color within the image.
   - A value of 0 means that a color component's original value remains unaltered.
4) Click the Reset button to return to the original image as it was before you made any adjustments. All parameters are reset to 0.
5) Click the File... button to save a set of parameters. A parameter set you have saved can be reloaded anytime and used for color adjustment on any image.
6) Click the Execute button to execute color adjustment using the current parameters.
   ➤ The dialog box will be closed and the current preview image will be written into the destination image buffer.
   - WARNING: If you have selected a certain image area using the Image > Set Frame command, color adjustment will only be applied to the image area selected via the frame.

- To apply the same color-adjustment parameters to other images, simply select the Adjust Colors > Execute RGB Adjustment command as often as needed.

Filtering gray-value images

Background Information

What are filters?

Filters are neighborhood operations: a pixel's brightness in the resulting image is computed by taking into consideration the brightness of the original pixel itself, as well as the brightness of its neighboring pixels (also in the original image).

How does a filter work?

The simplest filter is the mean filter. 3x3 pixels surrounding a pixel are added and divided by 9 (the number of pixels) to compute the pixel's brightness in the resulting image. This reduces statistical noise occurring randomly throughout the image by a factor of 3.

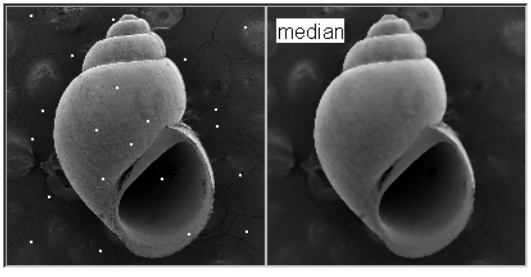
What types of filters are there?

The mean filter is a convolution filter: this kind of filter is defined via a matrix the size of the (pixel) neighborhood, e. g., 5x5. The numerical values of the matrix are weighting factors which are multiplied with the corresponding neighboring pixels. The mean filter, e. g., uses a 3x3 matrix of values of 1.
Another class of filters are the rank order filters. The median filter is one, for example. This involves sorting all the neighboring pixels according to brightness. The original pixel is then replaced with the median pixel of this ranking order. This filter is used to correct "shot noise" and single defective pixels.

What filter to use for what purpose?

- correcting statistical noise: NxN, Mean, Sigma, Lowpass, Rank
- correcting shot noise and defective pixels: Median, Rank
- enhancing contrast, accentuating image detail: Sharpen I, Sharpen II, DCE
- accentuating edges: Laplace, Sobel, Roberts, and others

"Shot noise" and single defective pixels can be deleted using the median filter. Edges remain sharp.



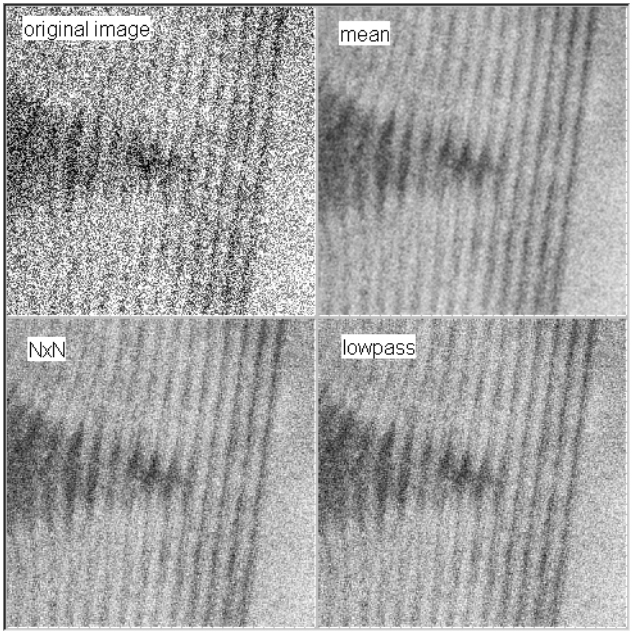
Step-by-step

Suppressing noise

1) Load the image or activate the image buffer. and set the destination image buffer.
2) Select the Oper > Filter > Mean command to average out statistical noise.
   ► The filtered image will be written into the destination image buffer.
3) Activate the original image. Set a different destination image buffer.
4) Select the Oper > Define Filter > NxN... command to define how much the image is be averaged.

➤ The Define NxN dialog box will be opened.

5) Click the Window button.
   ➤ The mouse pointer will appear within the image along with a red frame. The preview window is defined via mouse - while pressing the left mouse button. Rightclick to confirm.
   • All parameter adjustments made will appear immediately within the preview area.
6) Enter the number of times averaging is to be executed into the Iterations field. The higher the iterations, the greater the averaging. Start out with "1".
7) Enter the size of the neighboring-pixel area to be used for averaging into the Size field: e. g., "3" corresponds to an area 3x3 pixels in size.
   • The higher the value, the more the image is smoothed. Artifacts will also be smoothed, not just the actual edges.
8) Continue to adjust both parameters until you have obtained optimal results. Then you click the Execute button.



Statistical noise can be suppressed using various filters: Mean (upper right); NxN, iterations 1 and size 5 (lower left); Lowpass (lower right). In the filtered images, the basic structure within the image becomes apparent.

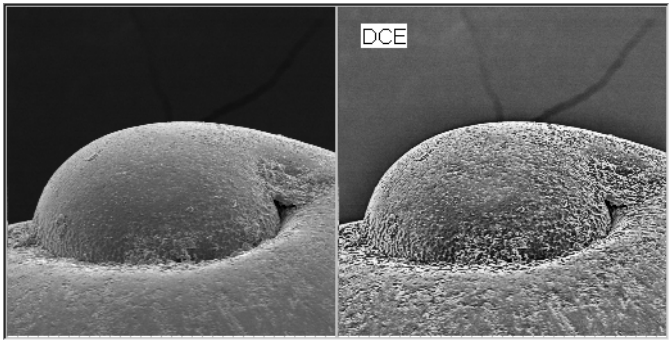
Increasing image sharpness

1) To increase image contrast select the Oper > Filter > Sharpen I command.
   • After suppressing noise or artifacts via a mean filter you can have the smoothed edges displayed sharply once again.

Accentuating image detail

1) Load the image and set the destination image buffer.
2) Select the Oper > Define Filter > DCE Filter... command.
   • The DCE filter enhances small local differences in brightness. Image details are thus accentuated; the more general structural elements retreat into the background.

3) Click on the preview window in the Define DCE dialog box so you can see how parameter adjustments affect the image.
4) Adjust the Bandwidth and Enhancement parameters alternately. The less bandwidth, the smaller the local differences in brightness which are enhanced. The greater the enhancement, the more these differences in brightness are accentuated. Keep adjusting until you find the optimal settings.
5) Select the Quality check box to suppress artifacts (located in areas of the same brightness) caused by the DCE filter.
6) Click the Execute button.



Use the DCE filter to increase image sharpness. Easily-overlooked image detail thus becomes readily visible.

Filtering RGB images

Background Information

RGB-Studio

The RGB-Studio consists of a group of commands especially developed for editing RGB images. RGB-Studio commands are located in the Oper menu.

You use the RGB Studio to:

- filter color images, e. g., using the following filters: Gamma, Hue, Saturation, Intensity, Contrast, Sharpen, Average, Remove Noise, Oilify, Posterize, Mosaic and many others;
- convert color images into 8-bit images using different color palettes;
- edit color palettes;
- rotate or clip color images;
- superimpose color images, or add a watermark;
- break down color images into their color components using various color models;
- colorize color images using one color;
- assemble gray-value images as color components of one of the color models into true-color images;
- define overlay objects of any shape and color;
- clip, fill and copy image areas of any shape.

Applying multiple filters

When working with the RGB Studio, multiple filter operations can be executed successively without having to select the RGB Studio > Apply Filters... command each time. Each operation is applied to the resulting image of the previous operation and then placed in a stack. This stack consists of all the filter operations in their order of

application on the image. This stack processing is reversible, i.e., one or more image operations can be reversed successively at any time if you're not happy with the results and thus wish to apply other filter operations.

filter	function
Gamma	modifies pixel-intensity values via the gamma function. Non-linearities of camera and monitor can thus be corrected.
Hue	modifies the pixel-color value H.
Saturation	modifies the pixel-saturation value S.
Intensity	modifies the pixel-intensity value I.
Contrast	increases or reduces image contrast.
Histocontrast	increases or reduces image contrast. Mean brightness is determined via the histogram to adjust image contrast.
Sharpen	increases or lessens image sharpness.
Remove Noise	substitutes the central color of neighboring pixels for the color value of each pixel.
Average	substitutes the average color of neighboring pixels for the color value of each pixel.
Solarize	an imitation of the effect on photographic film when coincidentally exposed to light briefly.
Oilify	gives an image the appearance of an oil painting.
Posterize	makes an image look like a poster.
Mosaic	adds a mosaic-like pattern to an image's appearance.
Emboss	shows objects in relief. Dark objects appear raised, light ones as depressions.
Noisify	adds random pixels to an images, i.e., noise. Noise values can be added for all color channels (red, green, blue) or just for one.
Histoequalize	linearizes the number of pixels per intensity value. This accentuates details in dark image areas.
Stretch Intensity	increases image contrast.
Invert	inverts pixel color values. The resulting image thus looks like a photo negative.

Step-by-step

Using multiple RGB-Studio filters

You wish to improve the appearance of an image. To do so, you want to conduct gamma correction, increasing image sharpness and improving image contrast.

1) Activate the image buffer with the original image.
   - Simply leftclick on the image buffer that has the original image in it.
2) Set the destination image buffer.
   - ► Your image analysis program will propose a destination image buffer. To alter the proposed destination image buffer, drag the desired image buffer - while pressing the left mouse button - from the image manager onto the operands box.
3) Select the Oper > RGB Studio > Apply Filters... command.
   - ► The image window will be minimized. A separate preview window showing the image in the active image buffer will appear.
   - ► The Apply Filters dialog box will be opened.
4) Select the Gamma filter in the Filter List.
   - ► The Value field will appear in the Parameter group.

- Use the arrow buttons next to the Value field to set the desired γ constant. The value range is 0.1 to 100.0.
- Any alteration of the γ constant is applied to the image immediately and shown in the preview window. Keep making adjustments until satisfied with the results.

5) To increase image sharpness select the Sharpen filter in the Filter List.
   ► The Value field will appear in the Parameter group.

6) Use the arrow buttons next to the Value field to set the sharpness desired.
- The value range is -1000 to +1000 Promille.
   ► Any alteration of sharpness is applied to the image immediately and shown in the preview window. Keep making adjustments until satisfied with the results.

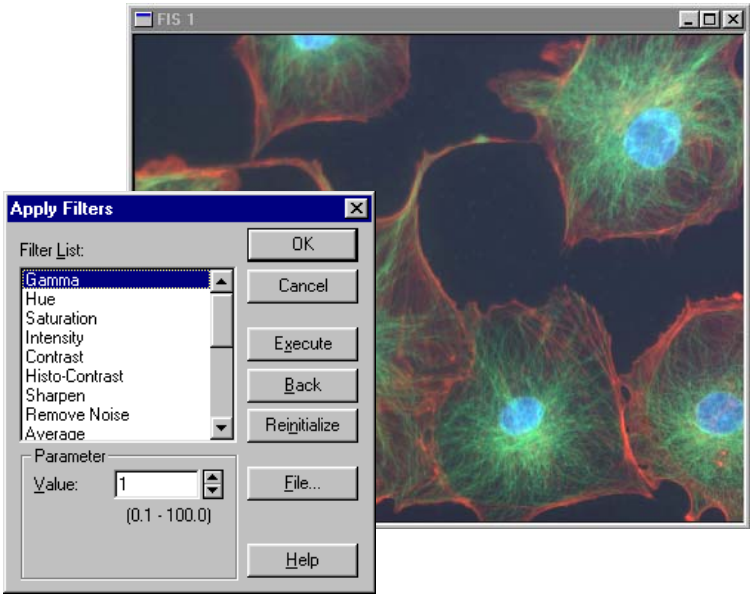
7) To increase image contrast select the Stretch Intensity filter in the Filter List.

8) Click the Execute button.
   ► The filter will be applied to the image and the results shown in the preview window.
   - To reverse the Stretch Intensity filter operation use the Back button - if image contrast is still too weak or perhaps even too great. Then apply the Contrast or Histocontrast filters. You set image contrast yourself when using these.

9) Apply other filters until you have altered the image as desired.

10) Click on OK to have the resulting image written into the destination image buffer.
   ► The preview window and dialog box will be closed.
   ► The resulting image will be shown in the active viewport.

Images are edited in a separate preview window when using the RGB Studio. All operations applied to the image are shown in this window immediately. All overlay information and/or automatic scale bar do not appear while you define filters.



Interactive Image Measurement

Your image analysis program offers a wide range of measurement functions. They enable you to quickly count objects and measure segments, areas and angles. All the results are saved together with the images and can also be exported to a sheet.

Background information

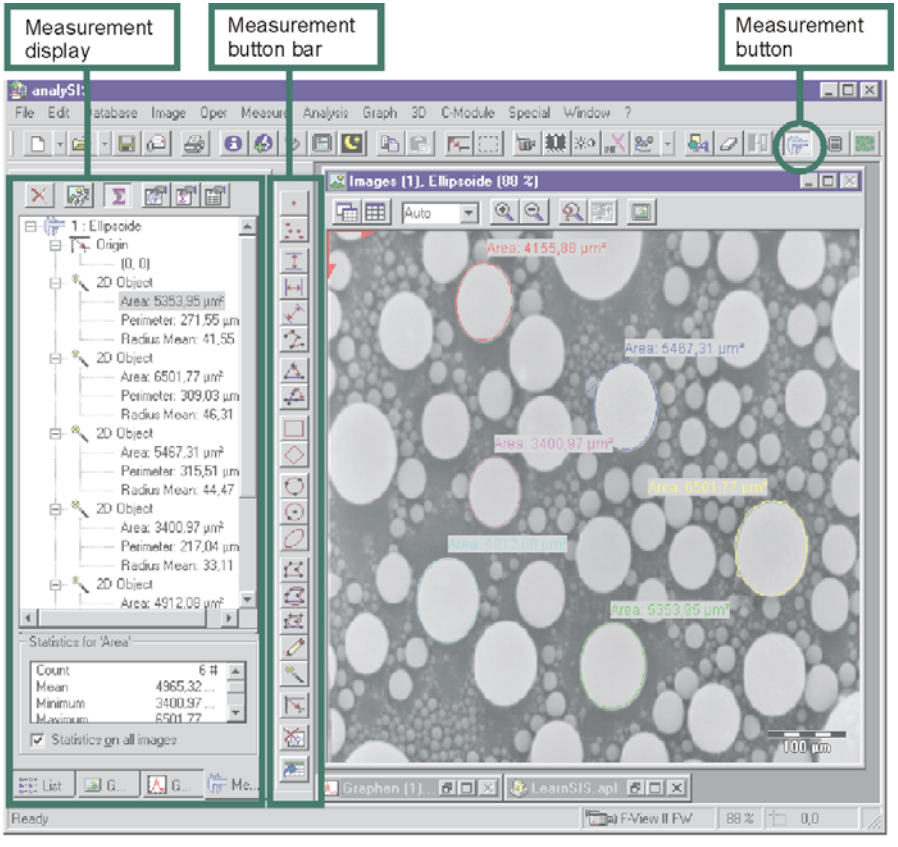
Measurement Environment

The measurement environment is a user interface which has been optimized for measurements done on an image. This measurement environment enables quick access to all measurement functions, measurement results and settings which effect the measurement.

*The **measurement button** located in the standard button bar activates or deactivates the measurement environment.*

*All the measurement functions can be found on the **measurement button bar**. Simply begin a measurement by clicking on the appropriate button.*

*The **measurement display** which contains all of the measured values, is activated in the image manager.*

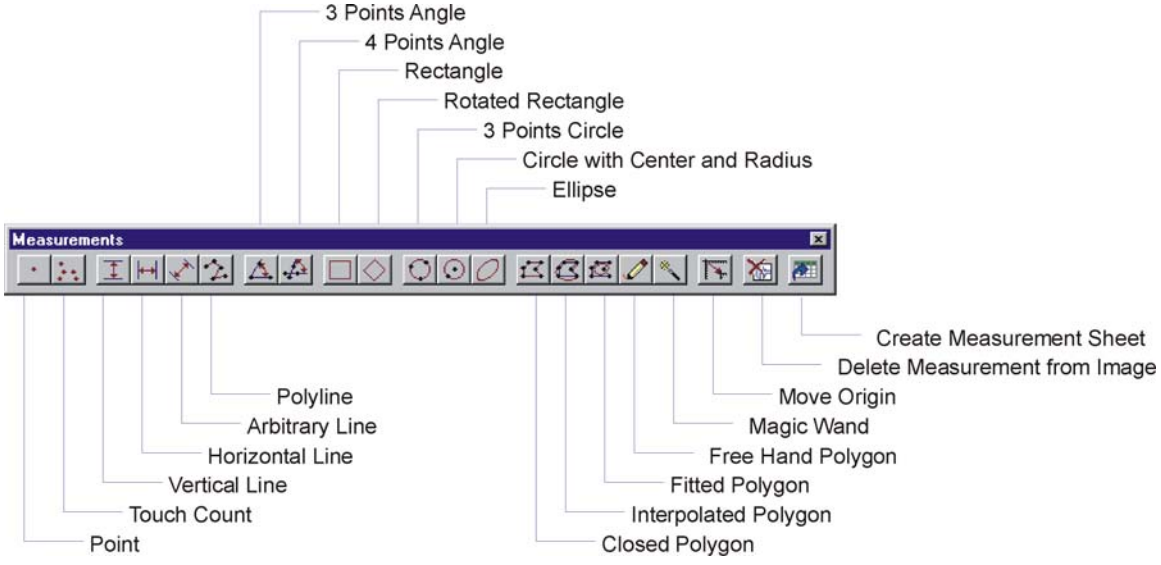


Exporting measurement results

The measured values are displayed in color in the image's overlay. In addition, all measurement functions create an entry in the measurement display. These measurement results remain linked to the image even after the image has been saved. You can export the measurement results to a sheet any time. To do so, click the Create Measurement Sheet button located in the measurement button bar.

Measurement button bar

All the measurement functions can be found on the Measurements button bar. There is one button for each function. Begin a measurement by clicking on the button with the desired measurement function. You can measure as many values on the image as you like. You end the measurement by either depressing the middle mouse button or the [Esc] key.



Step-by-step

This is how you measure distances and areas

You want to make various distance and area measurements on an image.

1) Load the image to be measured or acquire an image.

Warning

A correct image calibration is a requirement for a correct measurement.

2) Click the Measurements Bar button located in the standard button bar to switch to the measurements environment. Alternatively, you can use the [Alt + 4] key stroke or the Measure > Measurements Bar menu command.
   - ► A button bar with all the measurement functions is shown next to the image manager.
   - • The image manager alters its appearance. The Measurements tab serves as the measurement display and is activated. The measurement display is still empty.

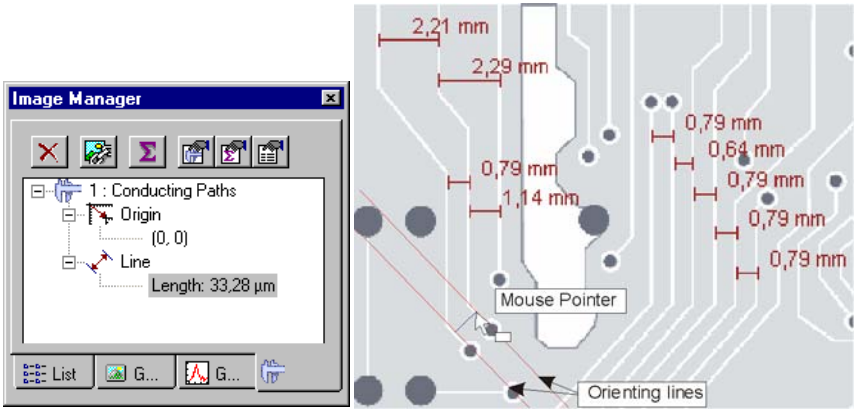
3) Select the measurement function you would like to use from the measurement button bar. Click the Arbitrary line button to measure any distance.
   - ► The pointer moves to the image window.

4) Position the pointer to the starting-point of the distance to be measured and depress the left mouse button.
   - ► Two edges appear in the image's overlay which are always vertical to the distance to be measured. Use the edges as positioning helpers for the distance to be measured.

5) Position the pointer to the end-point of the distance to be measured and depress the left mouse button.
   - ► The measured distance is shown in the image overlay.
   - ► The measured length is written to the measurement display.

6) Repeat the last two steps for all distances to be measured.

Select the distances you want to measure directly on the image. Two edges enable you to exactly position the start points and end points. All measurements are listed in the measurement display.



7) You end the distance measurement by either depressing the middle mouse button or the [Esc] key.
   - ► The pointer is released.

8) Select another measurement from the Measurements button bar. Select the Closed Polygon button, for example, to measure any area with the help of the polyline.

9) Set the individual points by depressing the left mouse button. Close the area by depressing the right mouse button.
   - ► In the measurement display, you will now find, in addition to the measured area, the perimeter of the measured object.

10) End the area measurement by either depressing the middle mouse button or the [Esc] key.
   - • You can insert additional measurement values onto an image or respectively delete single measurement values and measure them anew.

Save, Load and Edit Measurement Results

Background information

Measurement Display

The measurement display is a tab in the image manager and contains all of the measured values. The measurement display is empty as long as no measurement has been undertaken. As soon as the first measurement has been started, the measurement display will be filled. The values are organized in a tree view. The upper-most entry contains the number of the image buffer and the name of the image. The current position of the image origin is automatically displayed for each image. In the tree view, the object and the values beneath the object are expanded after measurement. A single entry is added to the tree view for each image which contains measurement

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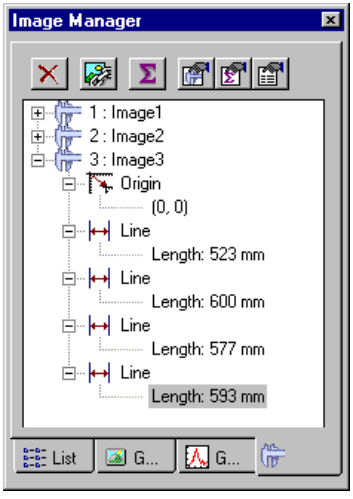
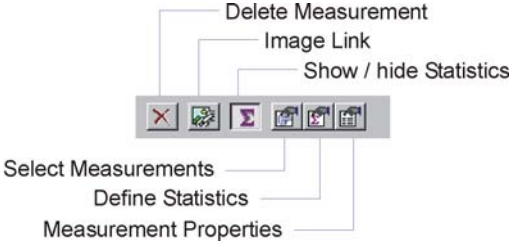
values.
The measurement display has its own button bar. Use the buttons for example to delete measurement values or to alter the presettings for the interactive measurement.

These images which have been loaded contain measurement values. Select the name of an image in the tree view to switch to that image. You can add new measurement values to an already existing measurement, or delete single or entire measurements.





Save measurement results

All measurement files are linked to the image. This link remains if you save the image in TIFF format. Either use the File > Save As... command or insert the image into a database. If an interactive measurement is linked to the image, the measurement results are automatically listed in the measurement display when the image is reloaded.

Warning

The measurement files are only then saved with the image if you use the TIFF image format. The measurement results are lost if you save the image in another format e.g., BMP or JPG.

Editing measurements

A one-time measured object can no longer be edited. You can, however, delete objects with faulty measurements and remeasure them. To do so, select the name of an image in the tree view to switch to that image. Select a measurement function from the button bar and measure the desired structure. The new measurement will be attached to the already existing measurements.

Measurement results and image overlay

Each interactive measurement also creates an image overlay which shows the measured object. The measurement overlay is linked to the measurement values and is automatically recreated from the measurement data when loading an image or when continuing an interactive measurement. Should you have edited or deleted the measurement overlay, the respective alterations will be reversed. This makes sure that the measurement overlay and the measurement files remain consistent. Be sure that you cannot alter the measurement data by editing one of the measurement objects in the overlay.

Step-by-step

This is how you delete single measurement values

1) Load the image whose measurement values you would like to delete.

2) Click the Measurements Bar button located in the standard button bar to switch to the measurements environment.
3) Select the value you want deleted in the Measurements tab.

- When measuring certain objects, such as a circles, numerous values are measured simultaneously. Please note that it is impossible to delete individual values with the delete function. You do, however, delete the entire measuring object that was measured.

4) Click the Delete Measurement button located in the measurement display.
   - ➤ The selected measurement value disappears from the tree view. The respective measurement object is simultaneously deleted from the overlay.
   - Please note that you cannot delete the measurement values by deleting the image overlay. The image overlay is recreated from the measurement files, as soon as the image has been reactivated or new measurements have been added.

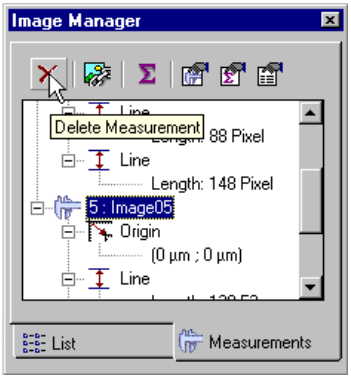
5) It is sometimes easier to delete a value from a measurement by simply identifying it on the image. In this case,click the Delete Measurement from Image button on the measurement button bar.
   - ➤ The pointer moves to the image window.
6) On the image, click on all the measurement objects that are to be deleted.
   - ➤ All deleted values disappear from the overlay and from the tree view.
7) Depress the middle mouse button or the [Esc] button once you have deleted all the values you wanted to delete.

This is how you delete an entire measurement

1) Select the image names from the tree view located in the measurement display.

2) Click the Delete Measurement button located in the measurement display.
   - ➤ The selected entry appears from the tree view. All measurement values which belong to this image are deleted.
   - You only delete the measurement value with this function, not the image. The image is continued to be normally loaded into the image buffer.

In the measurement display, select what you would like to delete.



This is how you identify a measurement on the image

If you have measured a very large amount of values, you will find it especially easy to find them on the image rather than in the measurement display.

1) Click the Image Link button located in the measurement display.
   - ➤ The pointer moves to the image window.
2) Click on any measurement object in the image overlay.
   - ➤ The respective measurement value is shown in the measurement display.

3) Depress the middle mouse button or the [Esc] key to exit the image window.

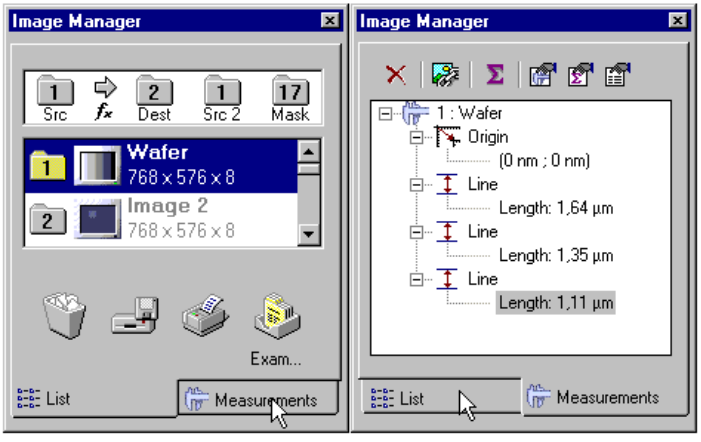
Create measurement sheets

Background information

Measuring on numerous images

Before each measurement, the images can either be newly acquired with your camera or you can load already saved images in successive image buffers. In both cases, please make sure that the image buffers list is always covered by the measurement display in the measurement environment. You can change the views at all times and again show the image buffer list. To do this, click on the List or Gallery tabs at the bottom of the image manager.
If you are offered too many tabs in the image manager, do the following: hide either the List or the Gallery tabs. Use the Special > Preferences > Image command.

Even if the measurement display covers the image buffer list, you maintain access to all the tabs of the image manager during measurement.



Create measurement sheet

Click the Create Measurement Sheet located in the measurement button bar to export the measured values to a table. All measurement values are always exported from one image to one sheet. If you have done measurements on numerous images, decide whether or not the measurement values for each image are to be exported to individual sheets or if all the measurement values are to be exported to the same sheet.

Data in the measurement sheet

The measurement object's type and the measurement values are listed in the measurement sheet. All areas are, for example, written to one column even if they were defined with different methods. If you export the measurement values from numerous images into one sheet, the measurements of the same type will be written to one column, e.g., all measured areas.
The unit of the measurement values in the measurement sheet corresponds to the unit in which the image has been calibrated. To change this unit, use the Image > Calibrate Image... command. If you are exporting the measurement values from various images to one sheet, the unit for all the images from the image calibration of the active image buffer is adopted.

Editing sheets

The possibilities of editing measurement sheets which have already been created is rather limited. You can alter the headers of the individual columns and hide values with the auto filter. You will find all commands which have to do with sheets in a separate context menu You can open the menu by clicking on a sheet with the right mouse button.

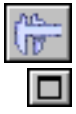
It is not possible to delete values or edit single values. In this case, you delete the measurement values either in the image or in the measurement display and create a new measurement sheet.

Step-by-step

This is how you measure numerous images

Distances are to be measured on numerous images and then later exported together to a sheet.

1) Load the images to be measured.



2) Click the Measurements Bar button located in the standard button bar to switch to the measurements environment.

3) Maximize the size of the image window so that you have the largest amount of space possible for displaying the image.

4) Click on the List or Gallery tabs located in the image manager, to show the image buffer with the loaded images.

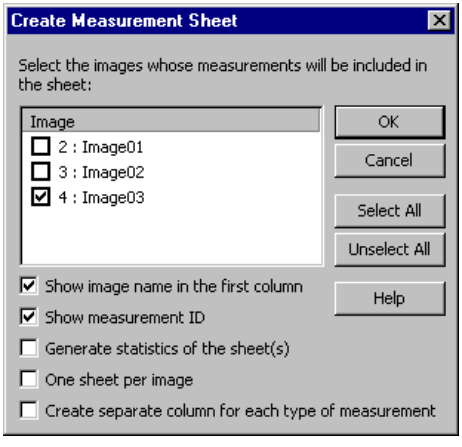
5) Load the image to be measured from the image manager.

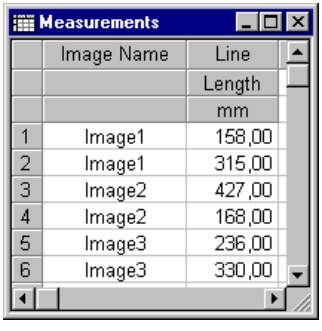
6) Measure the desired segments.

7) Repeat the last two steps for all the images on which you would like to make measurements.

8) Click on the Create Measurement Sheet button located in the measurement button bar.
   ► The Create Measurement Sheet dialog box opens.

The Create Measurement Sheet dialog box lists all the images on which measurements have been made. The active image is marked. This is where you decide if the measurement results of numerous images are to be exported to a common sheet or to separate sheets.





9) In the Create Measurement Sheet dialog box,click the Select All button to export the measurement results for all images.
   Select Mark the Show image name in the first column check box to additionally acquire the names of the images in addition to the values into the sheet. You can thus match the individual measurement values in the export sheet clearly to an image when using numerous images.

Related Topics
This is how you delete single measurement values 114
Create sheet 119

Clear the One sheet per image check box to write all the measured values to one sheet.
Confirm by clicking OK.

- ► The measurement sheet is created and displayed. In order to make the measurement sheet visible and to avoid having it covered by the image, your image analysis program automatically returns the image window to its original size.

10) After the measurement has been completed, release the Measurements Bar button.
    - ► The measurement button bar is once again hidden.

This is how you acquire a new image with a camera for each measurement

A series of images are to be sequentially acquired. Distances are to be measured on all the images.

1) Use the Special > Preferences... command. In the Images tab, select Image buffers (All) entry from the Image acquisition > Sequence list. Close the dialog box by clicking OK.
    - ► Your image analysis program now automatically jumps to the next image buffer before each image acquisition. This prevents an already existing image from accidentally being deleted during an acquisition.

2) Click the Measurements Bar button located in the standard button bar to switch to the measurements environment.

3) Maximize the size of the image window so that you have the largest amount of space for displaying the image possible.

4) Acquire an image: click the Acquire button to display the camera image live. In the live-image, look for an appropriate image structure and focus it.
   Click the Snapshot button to acquire an image.
    - You can also measure directly in the live-image. To do this, however, the live overlay must be activated. To do this, mark the Live overlay check box located in the Image > Configure Input > Display tab.
      The overlay can become rather confusing if you measure many values in the live-image. Click the button with the eraser symbol located on the standard button bar to delete the overlay. The already measured values will not be deleted in doing so.

5) Measure the desired segments.

6) Repeat the last two steps for all the images on which you would like to make measurements.
    - ► A new entry for each image is automatically created in the measurement display. As soon as you begin a measurement on a new image, all of the already existing measurements are reduced to the main entry in the tree view.

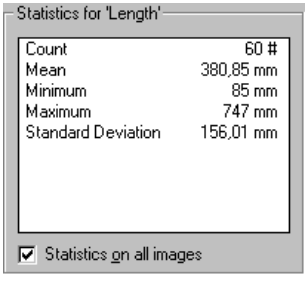
Using Statistics Functions

Background information

Statistic display

Your image analysis program automatically creates statistics for each interactive measurement which are shown in the Statistics group located in the measurement display. You can hide or show the statistic values by clicking on the Show/hide Statistics button located in the measurement display.
The name for the Statistics for '...' group is dynamic and it shows the measurement value to which the statistics are displayed. Should numerous values, e.g. area, perimeter and mean radius be measured in a measurement method, click on one of the measurement values in the measurement display to show the statistics data of the selected measurement value instead.
The Statistics on all images check box is marked and is a default setting. For this reason, the measurement values of the measured images contribute to the statistics. Clear the check box to view only the statistics of one image. Please note that this check box only deals with export to the measurement display and not with the export to a sheet.

A total of 60 segments were measured on numerous images. The mean segment length is provided. The spread of the measurement results is provided by the standard deviation.



Select parameter

Your image analysis program offers a wide range of statistic parameters. Click the Define Statistics button in the measurement display to select parameters which are relevant for measuring. Only the selected parameters appear in the measurement display and in the statistics sheet.

Create sheet

You can always export the statistics of measured values to a sheet. In doing so, you determine which images are to be considered for the statistics in a separate dialog box. The statistic values are always written to a separate sheet; they cannot be written to a sheet together with the measurement values.

Step-by-step

This is how you work with the statistics functions

1) Carry out an area measurement on numerous images.
   ► The Statistics for 'Area' group located in the measurement display is updated after each executed measurement. By default, it contains the amount of executed measurements, the mean, minimum and maximum area measured and the standard deviation.
2) In the tree view, select the Perimeter measurement value.
   ► The data in the measurement display no longer correspond to the measured areas, but to the measured perimeter.

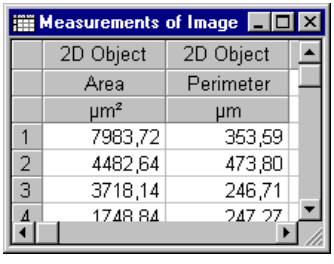
3) Click the Define Statistics button. You will find the button in the measurement display above the tree view.
   - ► You will find all available statistic parameters in the Define Statistics dialog box. You will find an explanation to each parameter selected.
     All of the parameters which are currently selected are shown in list on the right entitled Current. You can always alter this selection without having to repeat a measurement.

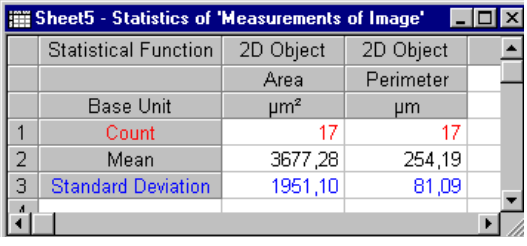
4) Should the statistical values Minimum and Maximum not be shown, select the parameter Minimum and Maximum located in the Define Statistics dialog box and click the <<Remove button. Close the dialog box by clicking OK.
   - ► The minimal and maximum values have disappeared from the measurement display.

5) Click the Create Measurement Sheet button located in the measurement button bar.

6) Mark the Generate statistics of the sheet(s) check box located in the Create Measurement Sheet dialog box and confirm with OK.
   - ► A sheet with the statistic parameters is created and shown in addition to the measurement sheet. All of the measured values are acquired to the sheet. A separate column is created for each value. The statistic parameters shown correspond to the parameters which you selected in the Define Statistics dialog box.

In addition to the measurement sheets, you can also export a sheet with measurement statistics.





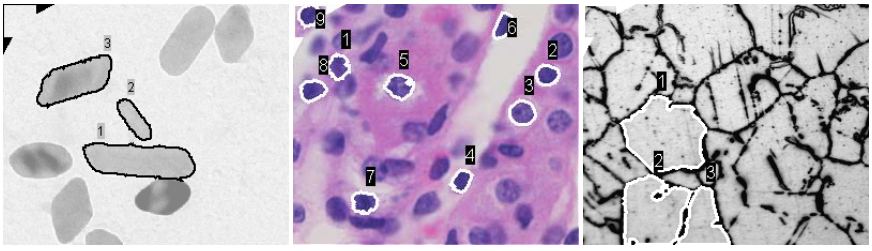
Measuring Arbitrary Structures

Background information

Magic wand

Use the magic wand located in the measurement button bar to quickly and comfortably select an object of any shape. To do this, you mark a a typical point within the object. Your image analysis program then automatically searches for points in the area which have similar gray or color values. An object which can be collected with a magic wand must be able to differentiate itself from the background based on its color or its gray value.

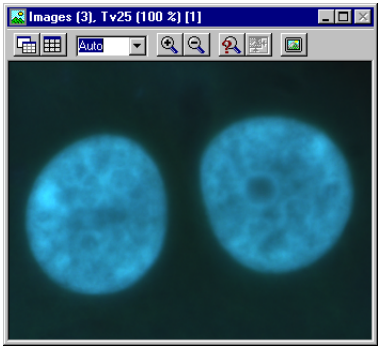
Examples of objects which can be located well with the magic wand.

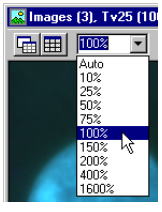


Step-by-step

This is how you define an object with the magic wand

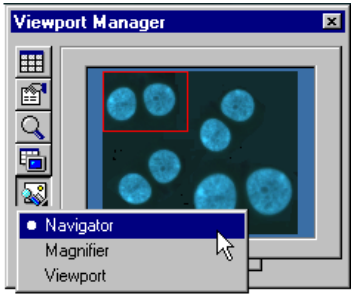
In this example, the colored cell nuclei are to be measured. The mean color value should also be acquired in addition to the area of the cell nuclei.





1) Load the image you want to measure into the active image buffer.
2) Select a zoom factor of 100%. This is the best setting for the magic wand.
3) When measuring a large image, use the navigator to select the area of interest in the image before starting the measurement.
   Click the bottom most button in the viewport manager and select the first entry entitled Navigator from the list of the available views.
   By keeping the left mouse button depressed, move the red frame in the viewport manager onto the object which is to be measured.

The navigator view in the viewport manager always shows the entire image. The red rectangle shows which image section will be shown in the image window. Select the image section of interest with the mouse directly from the thumbnail image shown.



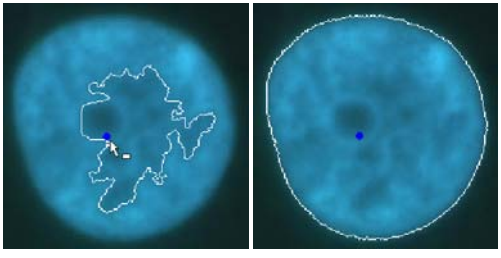
4) Click the Measurements button located in the standard button bar to switch to the measurements environment.
5) Click the Magic Wand button located in the measurement button bar.
   ► The pointer moves to the image window.

6) Click on a typical color value in the object you would like to measure.
   - ► The point selected in the object is marked by a blue point in the overlay. Your image analysis program immediately looks for the object and highlights it with a red lining in the overlay.

7) Should the desired object not have been correctly found, keep the left mouse button depressed and pull the mouse to the **left** to reduce the size of the object. Keep the left mouse button depressed and pull the mouse to the **right** to increase the size of the object.
   You can view the result as soon as you release the mouse button.

8) Click the right mouse button to end the definition of the first objects.
   - ► A new measurement is created in the measurement display. The area and perimeter is given as default measurement values.
   - ► The pointer remains in the image. You can immediately measure additional objects.

The pointer in the left image is located on the object's selected point. Only a part of the object is found. Keep the left mouse button depressed and pull the mouse to the right to select the entire object.



9) Click the middle mouse button to end the measurement.

Background information

Selecting measurement parameters

Especially for two dimensional objects, you can measure a lot more than area and perimeter. Your image analysis program offers you an entire row of measurement parameters from which you can choose the appropriate one. Even after the definition of the measurement object, you can always alter the measurement parameters which are to be exported.
Various measurement parameters are only available for various classes of measurement objects. The measurement of the area of a line is senseless and therefore is not even offered as a function when measuring line objects.
The selected measurement parameters are shown in the tree view in the Measurement tab as well as in the measurement sheet.

You will find a description of all the measurement parameters in the Select Measurements dialog box. In the measurement parameter list click on the name of a parameter to show the description and a schematic drawing in the dialog box. You can print a list of all the measurement parameters from the online help.

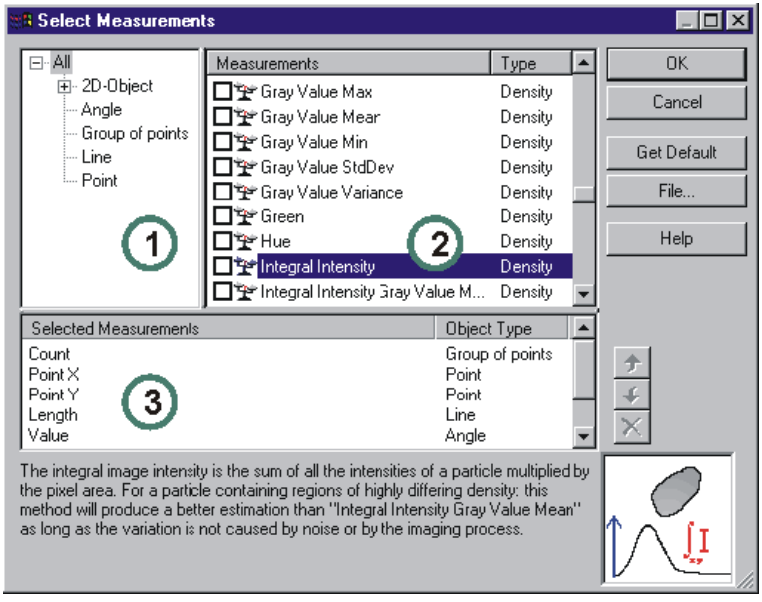
The Radius Mean parameter is explained here as an example.
The radius mean of an object with any form, e.g. rectangle is calculated in the following way: the program calculates the center of the object and lays many straight lines through this point. Two intersections of one line with the actual perimeter deliver the values for a radius. The mean radius is the mean value of all radii determined this way. The mean radius is the circle's radius when dealing with a circle.

The Select Measurements dialog box is divided into numerous sections:

1. You will find various types of measurement objects in the tree view.

2. The list contains all of the measurement parameters which are at your disposal. The measurement parameters are shown for the types which are marked in the tree view.

3. The Selected Measurement list shows which measurement parameters are to be shown in the measurement display and in the results sheet.

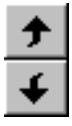


Types of Measurement Objects

All measurements are divided into five different types: points, point-groups, lines, angles and 2D objects. Each type has defaults for various measurement parameters which are offered as defaults for a measurement. A circle, for example, is a 2D object. By default, the area and perimeter are exported as a measurement result.

Please note that the measurement parameters for all types of measurement objects are shown in the Selected Measurements list. Only the measurement parameters which are relevant to the measured object, however, are shown in the tree view of the measurement display. An angle value will not be exported for a 2D object.

Sequence of active parameters



You can change the sequence of the active measurement parameters. The sequence defined here is adopted by the measurement display and the export sheet. If the Show labels > Measurment result option is selected in the measurement settings, measuring results are also written into the overlay. Here it is, where you determine which parameter is displayed, if you are measuring more than one parameter. If you want to display measurement results in the overlay, the program always shows the first measurement parameter.

Step-by-step

This is how you select measurement parameters

You measure 2D Objects. You are interested in the area and the color of the object.

1) Measure a 2D object for example with the Magic Wand measurement function.

2) Click the Select Measurements button. You will find the button in the measurement display above the tree view.
   - ► The parameters are classified based on measurement types in the tree view located in the upper left hand part of the dialog box.
3) In the tree view, select the 2D-Object entry to limit the measurement parameter list to the parameter for 2D objects.

4) Mark the check box of a measurement parameter in the Measurements list to activate it for the measurement.

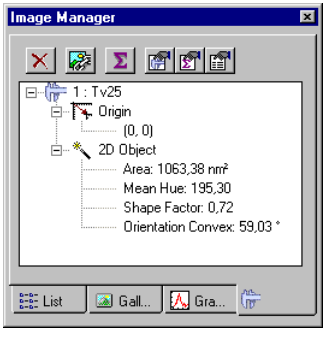
5) For example, mark the Mean Hue check box to measure the hue of a 2D object. An object's hue corresponds to the mean hue of all pixels which belong to this object.
   ► The selected parameter has now been activated for the measurement and will be shown in the Selected Measurements list below.

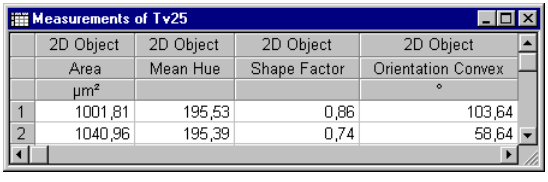
6) In the Selected Measurements list, select one of the default parameters for 2D objects, e.g. Radius Mean. Click the Delete button.
   ► The deleted parameter has now been deactivated for the measurement. It is of course available for later measurements.

7) Close the Select Measurements dialog box by clicking OK.
   ► The measurement display is updated and shows all of the active parameters which can be used on a 2D object. The sequence of the measurement parameters is adopted from the Select Measurements dialog box.

8) Create a measurement sheet.
   ► The measurement sheet contains all the active parameters. The sequence of the measurement parameters is adopted from the Select Measurements dialog box.

There are more measurement parameters available for interactive measurements than those shown by default.





	2D Object	2D Object	2D Object	2D Object
	Area	Mean Hue	Shape Factor	Orientation Convex
	µm²			°
1	1001,81	195,53	0,86	103,64
2	1040,96	195,39	0,74	58,64

Optimizing work environment for measuring

Background information

Magnifier and Navigator

Your image analysis program offers you Navigator and Magnifier to set measurement points as accurately as possible onto large images. Both settings can be found in the viewport manager. Click on the last button to get a list with the possible Navigator, Magnifier and Viewports views. Select the desired view.

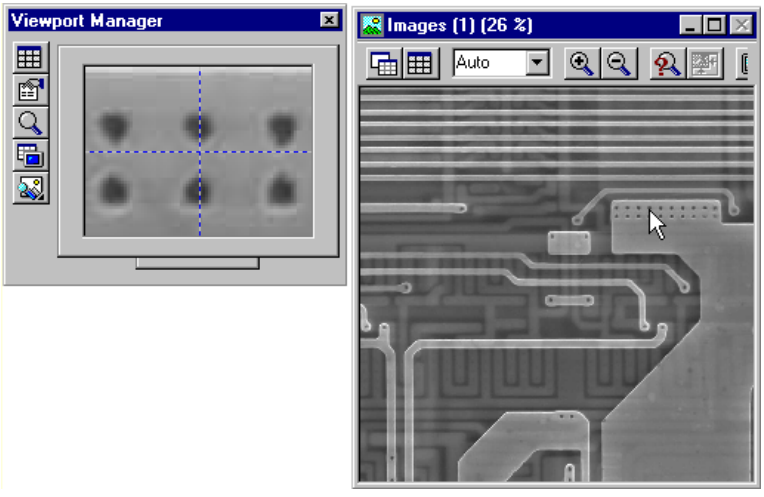
- **Working with Navigator:**
  View the image in the image window with a zoom factor of 100%. When using a large image, only a part of the image will be shown. The Navigator view always shows the entire image. This way you can keep an eye on things and find your way around on large images. The red rectangle in Navigator shows which image section will be shown in the image window. Before a measurement, select a part of the image you are interested in directly in Navigator, by moving the red frame onto the overview image by keeping the left mouse button depressed.

- **Working with magnifier.**
  Select the automatic zoom factor for the image in the image window. A large image will be shown greatly reduced in size. The magnifier view in the viewport manager shows a magnified section of the image beneath the current position of your mouse. The current position of your mouse is shown by cross hairs in the magnifier. You can set the zoom factor for the magnifier by clicking on the image in the viewport manager with the right mouse button and selecting the desired zoom factor from the context menu.

Note

You can move the image under the magnifier's cross hairs with the arrow keys of your keyboard during measurement. Use the arrow keys to set a point as accurately as possible.

The magnifier in the viewport manager on the left magnifies the image section under the current position of your mouse. (right)



Altering Measurement Settings

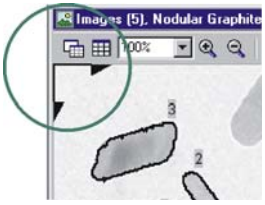
In the measurement display, click the Measurement Properties button to change the program's general settings which have to do with interactive measurements.

- Clear the Continuous measurements check box, when wanting to use various measurement methods or simply executing a single measurement. The pointer appears in the image only for one measurement. After a value has been measured, the pointer returns back to the measurement button bar.
- You determine which files are to be written to the image overlay during a measurement in the Show labels group.
- You determine the color of the measurement objects located in the image overlay in the Label style group. The font size and font thickness of the measurement overlay can be altered in the View tab.

Origin of the Coordinate System

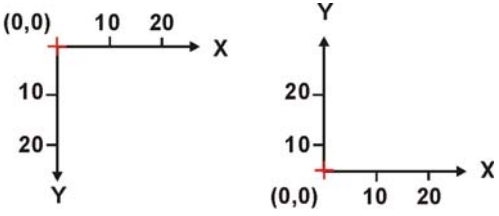
There are some measurements where the coordinate origin is important. Such a case is the measurement using the Points button. The measured point position is given corresponding to the origin of the coordinate system.
By default, the origin of the coordinate system can be found in the upper left corner of the image. Click the Move Origin button to move the coordinate's origin to a desired position on the image. All values already measured are adapted to the new origin.

The coordinate origin is shown by a red coordinate system in the image's overlay.



In the measurement settings, mark the Use inverted Y axis check box to place the origin of the coordinate system in the lower left corner. The new position of the coordinate system will only be taken into consideration for newly acquired images.
The origin of the coordinate system remains in the lower left corner for already existing images. As it is mirrored with respect to the X axis, the resulting X values are positive and the resulting Y values are now negative.

The drawing shows the origin (0,0) and the X and Y- directions of the coordinate system. You can see the values on the preset Y axis; the inverted axis to the right.

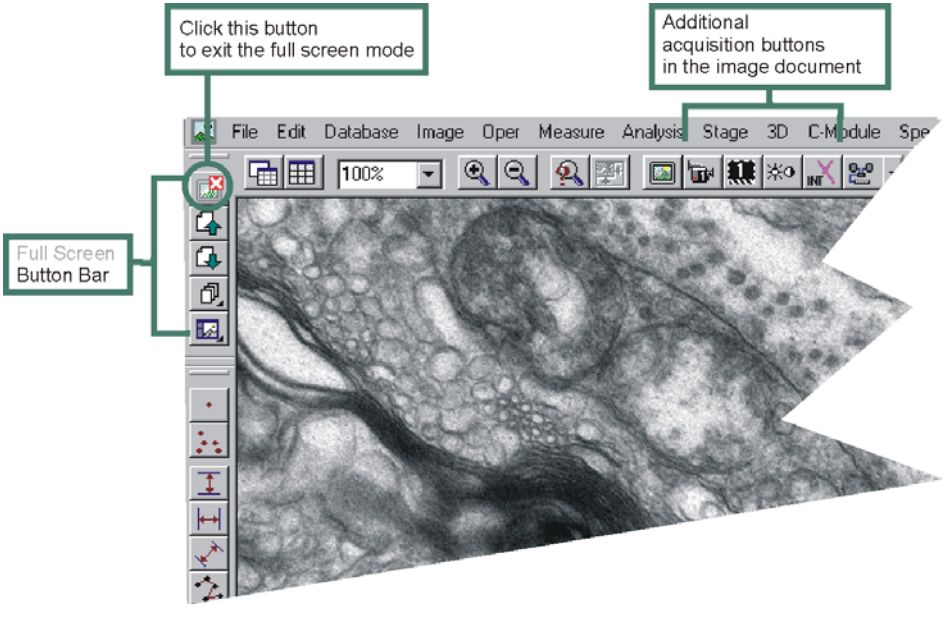


Full Screen Mode

If you execute many interactive measurements, it is advisable to optimize the user interface for the measurement. Use the Full Screen mode, for example, to remove disruptive elements from the user interface and to create as much space for the image as possible. The modus can be activated by clicking the Switch context button located in the standard button bar.

To execute a measurement, switch to the Full Screen mode if you need as much room as possible to view the image.

The measurement button bar is not shown in Full Screen mode by default. You must insert it in order to be able to execute measurements in Full Screen mode.



Step-by-step

This is how you measure in Full Screen mode

The following step-by-step "How to..." is only an example of how an interactive measurement can proceed on numerous images in Full Screen mode. You can of course configure the Full Screen mode differently or you can measure in the preset measurement environment.

1) Load all the images you want to measure.

2) Click the Switch context button in the standard button bar.
   - ► The image window is automatically maximized.
   - ► All but one of the button bars are hiden.
   - ► The buttons for image acquisition are additionally integrated in the image window's button bar.
   - ► The Switch context button bar appears on the left side.

	Button	Description
	Close Switch context	Ends the Full Screen mode. The user interface once again looks like it did at the beginning of the Full Screen mode.
	Select previous buffer	Activates the next image buffer, respectively the previous image buffer.
	Select document	Opens a list with all open windows (image window, database, graph window, 3D window, sheets and diagrams, ...)
	Display additional components	Opens a list with additional components, which can be added in Full Screen mode: standard button bar, image manager, and viewport manager.

3) Click in the image window's button bar using the right mouse button.
   - ► A list with all the available button bars appears .

4) Select the measurement button bar from the list.

5) Pull the button bar to a preferred position, e.g. under the Switch context button bar.

6) Execute the measurement on the first image.

7) Click the Select next buffer button to display the image in the next image buffer and to measure it.

8) Exit the Full Screen mode after the measurement, in order to exit and save the measurement values.

Creating 3-D surfaces

Creating models

Background information

What are height images?

Confocal laser microscopes, scanning probe microscopes and stereographs provide height maps of an object's surface: the heights measured are encoded in a gray-value image. Height is in proportion to pixel intensity values using the above-mentioned methods. The height map is used to create a three-dimensional representation of the object's surface.

What are texture images?

You can have the gray or color image of the object surface placed over the 3D model of the height map to serve as texture. The color information will be combined with the height information, making the model look especially realistic.

3-D surfaces via EFI images

The Extended Focal Imaging module enables you to compute an EFI image using a series of images (of a surface) at varying levels of focus. All areas of this EFI image will be clearly focussed. Furthermore, you can also generate an EFI height map. The height map has to be averaged using a smoothing filter, e. g., using the Oper > Filter > NxN command. The 3-D model of the surface is then generated using the height map. Use the EFI image to texturize the 3-D model.

Calibrated height images

The calibrated height values are directly used with images whose image intensity has already been calibrated. When using calibrated height maps, each gray value corresponds to a specific object height. You can calibrate the height map with the Image > Calibrate Image > Image Intensity or Image > Define Image Calibration... . A calibrated height image is required for the following:

- to obtain a model that is true to scale,
- if height is not in proportion to pixel intensity,
- to be able to measure lengths or distances.

Step-by-step

Creating models

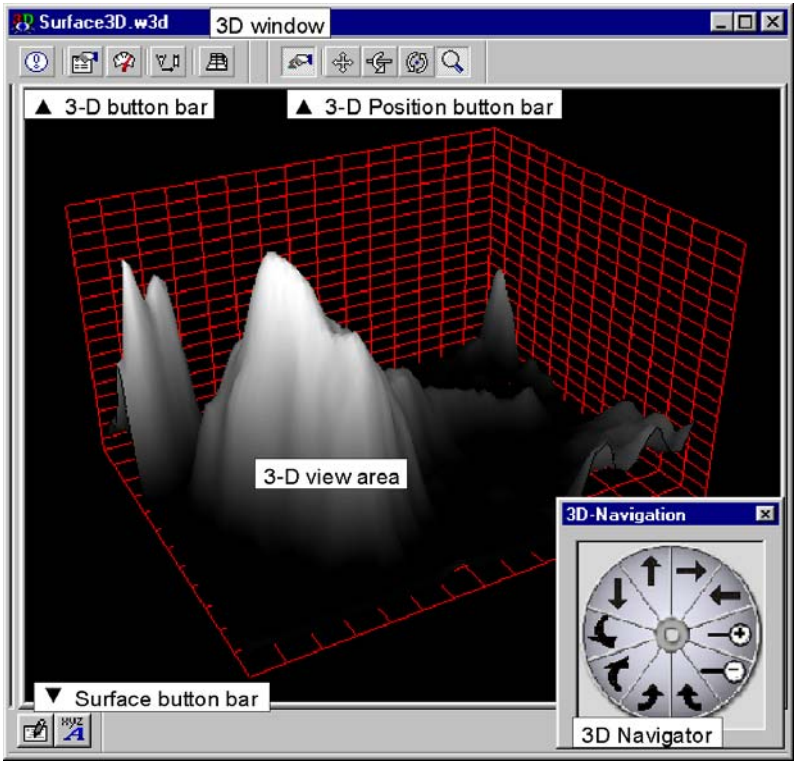
1) Load the height image of the object's surface into an image buffer. Load the texture image - if available - into another image buffer.

Height map (above left) and texture image (above right) of a pitch specimen.

2) Activate the height image. Select the Oper > 3D-Surface > Create command.

► The 3D window will be opened and the model displayed. Only one model can be shown at a time.

3-D surface generated via height map.



3) Drag&drop the corresponding texture image onto the model.

- You wish to make the texture image disappear: select the Surface (button bar) > Modify 3D-Surface... > Encoding > Height coded option.
- You wish to enlarge the 3D window: press [Alt+1], and [Alt+2] to get rid of both the viewport manager and image manager.

Moving your model

1) If the 3D Navigator is not shown, select the Window > 3D Navigation command.
2) Click (and hold the left mouse button) on one of the 3D Navigator buttons to execute a transformation.
3) To accelerate the motion, click closer to the navigational button's outer edge.

4) If the motion seems too slow: press the Fast positioning button inwards (3-D button bar - upper edge of 3D window).
   ► The model will disappear from view during the actual motion, and a visual positioning aid will be shown.

5) You can press the following to move the model:

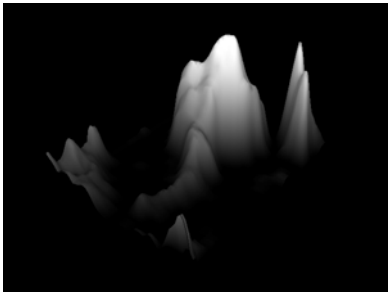
[Ctrl] + arrow keys	rotation/tilt to the right (or left, backwards, forwards)
[Shift] + arrow keys	move rightward (or leftward, upwards, downwards)
[Shift] + [PageUp] ([PageDown])	reduce in size (or enlarge)
[Shift] + [Home]	reset to default position

6) If the model is no longer in view because it is positioned outside of the 3D window: doubleclick on the center of the 3D Navigator.

Model presentation

1) Click the Hide Bottom Grid button inwards (3-D button bar - upper edge of 3D window) to have the grid disappear.
2) Click the Rendering Settings... button (3-D button bar). Select the Animation tab.
   - Click on Start to begin animation of the model. Wait until the animation has ended or interrupt it with [Esc].
   - The rotational direction and degree for animation is set in the Increment X, Y and Z fields.
3) Go to the Options tab. Set the Width and Height of the output image. Close the Rendering Settings dialog box.
4) Activate any empty image buffer to copy the 3-D view area (as currently shown) into an image buffer. Rightclick on the 3-D view area and then select the Copy to Image Buffer command.

Images of the 3-D model: texturized using the intensity values of the height map (left); including the texture image (right).



Editing models

Background information

Modifying 3-D surfaces

Click the Modify 3D-Surface button. You will find the button in the lower left corner of the 3D window by default. Some options contained in this dialog box are described in the following.

Height

You can set the relative height of the model surface as you like. Height is correctly scaled for calibrated height maps. Models created using non-calibrated height maps will have height values determined in proportion to image intensity.

Resolution

The level of detail and how smooth the model surface is depend on how many height-map pixels are used to compute the model. This is what step width defines.

Restricting image area for model

- You can cut out the desired image structure using a frame in the height map (Modify 3D-Surface > ROI): this is how you create a model based on an image segment.
- Globally-set frames (Image > Set Frame) are of no use here.
- Height maps based on stereographs, for example, have a border whose gray value is constant. Click the Modify 3D-Surface > Auto-ROI button to have this border clipped automatically.
- If you wish to compute a model based on one or multiple arbitrarily-shaped image segments, you need to define a mask image. While pressing [Ctrl], drag the mask image onto the 3D window. Activate/deactivate the mask via the Modify 3D-Surface > Use mask check box.

Step-by-step

Setting height

1) Make the grid visible to be able to see the scale graduation of the axes. This is done by clicking on the Hide Bottom Grid button (3-D button bar) so that it is not depressed.

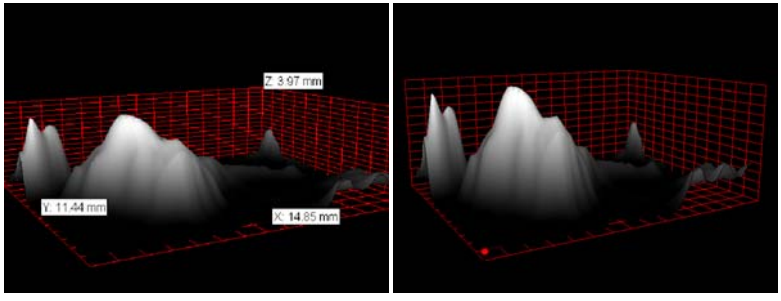
2) Click the Modify 3D-Surface... button (Surface button bar at the lower edge of the 3D window).

3) Enter the percental height of the brightest or highest pixel of the height map relative to the maximum value of length and width into the Height field.
   - An entry of 0% results in a model that is a plane. At 100%, the model's height equals its length/width. Low percentages yield flatter, gently-inclined models; higher percentages more steeply-inclined models.

4) Select the Display data check box to have length, width and height shown.

5) Close the Modify 3D-Surface dialog box.

When working with a calibrated height image you can determine the height of the model surface via the data visualized - length, width and height (above left). If the height image is uncalibrated you simply have to judge using your own eyes.



Setting resolution

1) Click the Modify 3D-Surface... button (Surface button bar at the lower edge of the 3D window).

2) The entry you make into the Step width field determines whether, e. g., every 10th pixel of the height map is to be used for the display of the model (if you enter "10").
   - The default entry is "10". In many cases this is, in fact, a suitable compromise.

3) Increase the step width if the model has too many peaks obscuring the model's primary structure, thus interfering with the overall (visual) impres-

sion the model makes.
Apply a smoothing filter (e. g., Oper > Filter > NxN) to the height map before creating the model to reduce high contrast transitions and to avoid sharp edges.

4) Decrease the step width if the model appears unnaturally rough or if significant surface detail is not apparent.
The lower the step width, the slower the motion of the model because more points have to be computed for display of the model.

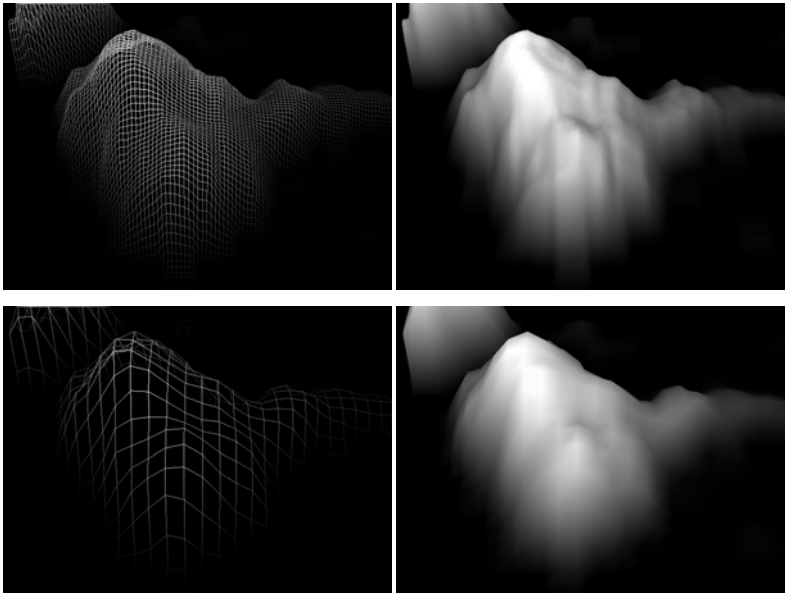
5) Select the Display as grid check box.
   ► The continuous model surface will disappear from view and be replaced by a grid representing the surface structure. The height of the grid nodes are computed via the corresponding intensity values of the height map. Any interjacent height values of the model will be computed by interpolation.

6) Observe how the mesh size of the grid increases and decreases parallel to your increasing and decreasing step width.

7) Now clear the Display as grid check box.

8) Close the Modify 3D-Surface dialog box.

Step width determines how detailed and how smooth the surface of the model is displayed. Too much image information may interfere with display of the model surface (above: step width of 5; below: step width of 20).



Creating a model of an image segment

1) Click the Modify 3D-Surface... button (Surface button bar at the lower edge of the 3D window).

2) Click the ROI... button to create a model based on a rectangular segment of the height map.
   ► The image window containing the height map will be activated. Define the image segment desired using the red frame.
   • This is how you can cut out a particular surface structure, or clip dark or light image edges.

3) Close the Modify 3D-Surface dialog box.

Use ROIs or masks to display the desired segment of the height map as a model.

Coloring models

Background information

Coloring 3-D models

You determine the color and shading of the model via various settings:

- **Encoding**
  The following can be used for coloring your model: height information, a texture image, height-image intensity values, or single-color display.
- **Lighting up your model**
  Turn on the (artificial) light! You can switch on an artificial light source. Light-source position, brightness, color and degree of shadowing are determined by you.
- **LUT**
  You can select any palette you like for the model. The palette results in the model being colored according to height. Or, you can also have height lines shown in the model.

The resulting color of any point in the model is composed of all three (above) settings.

Saving/opening 3-D models

A 3-D surface consists of a series of files. The main file is the layout file, which has the W3D file name extension. Any model alterations will automatically be saved in these files.
Each new model (Oper > 3D-Surface > Create) is initially given the following standard name: "Surface3D.w3d". All model files are saved in the program directory at "...\3D Objects\Surface3D\". If you wish to keep the model (and not have it overwritten), then select the File > Save as... command and save the W3D file using a different name in a separate directory. All the other files of the model will automatically be copied to this directory. After these steps, your continued work will be with this copy of the 3-D surface.
To open an existing model, select the File > Open... command, "3D-Workspace (*.w3d)" file type.

Step-by-step

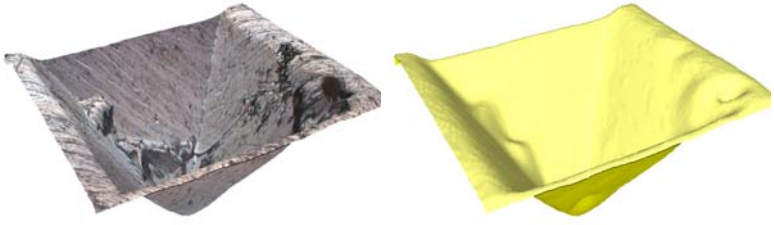
Texturize your model

1) Click the Modify 3D-Surface... button (Surface button bar along the upper edge of 3D window).
2) Select how you want the model colored in the Encoding list:

- Select Single color to have the 3-D model displayed in a single color. To select the color desired, click the Colors... button. Doubleclick on the Front field and select your color. Select the color of the underside of the model via the Back field.
- Select Texture to have the model colored using a texture image. If you haven't yet loaded a texture image: click OK to close the dialog box and drag&drop the texture image onto the 3D window.
- Select Height coded to have the model texturized in proportion to its height over the bottom grid. This means that a height of 0 is assigned a gray value of 0; maximum height is assigned the gray value of 255. All this to say that (model) valleys appear dark and peaks bright.
- Select Texture from height to have the model colored using the image intensities of the height image.

3) Close the Modify 3D-Surface dialog box.

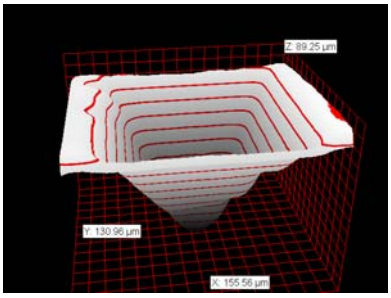
This pyramid-shaped indentation (left) was the result of a Vickers material hardness test. The surface is shown including the texture image (left), and in single-color display (right).

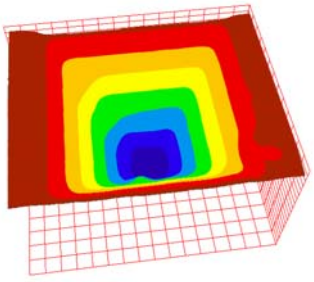


Coloring models via palette

1) Click the Modify 3D-Surface... button (Surface button bar along the upper edge of 3D window).
2) The LUT list is where you determine whether you wish to have the model additionally colored via a lookup table or not. No lookup table is the default.
3) Select Height lines to have height lines shown on the model.
   Click the LUT... button to adjust distance, thickness and color of the height lines as well as the color of the surface.
4) Select From file to select a LUT for the model. You load the LUT file desired via the LUT... button. The "...\Lut" directory in your program installation contains a number of predefined files.
   The LUT assigns a color to each height value.
   ► The colors provided by the LUT selected are transparent. This means that, e. g., if the model is a solid color, the model color will blend with the LUT colors.
5) Clear the Modulate LUT check box to have the model colored using the colors of the LUT selected only. This cancels the encoding.
6) Close the Modify 3D-Surface dialog box.

The coloring of the surface has now been height-encoded (left). Additional height lines, along with grid and calibration data are shown on the model. You can select a LUT for the surface, in this case called "Thermal" (right).



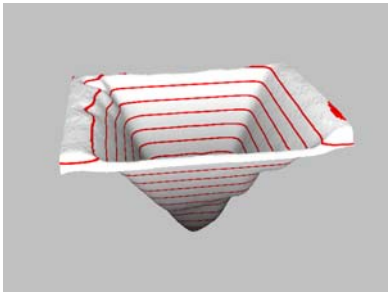


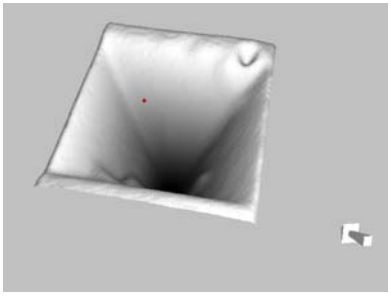
Lighting up your model

1) Click the Modify 3D-Surface... button (Surface button bar along the upper edge of 3D window).
2) Select the Enable light check box to have your model illuminated using an artificial light source.
3) Close the Modify 3D-Surface dialog box.

4) Click the Rendering Settings... button (3-D button bar) along the upper edge of 3D window. Select the Light tab.
5) Define the intensity of this light source in the Intensity field.
   The Shadowing field is where you set the reflectivity of the model. The higher the shadowing, the more tangible the model will seem.
   Select the color for your light source in the Color field.
6) Select the Show position arrow check box. Reduce the distance in the Distance field until the position arrow comes into view.
   Clear the Position with navigation window check box. Select the Fixed in space position.
   The entries of the Distance, Rotation X and Rotation Z fields are for moving the light source in relation to the model. The 3D Navigator, on the other hand, is for moving the model in relation to the light source.
7) Close the Rendering Settings dialog box.

The artificial light source makes the model surface look more tangible (left). You can use an arrow to indicate the light source's position and then have the model illuminated from various angles (right).





Choosing a background color

1) Click the Rendering Settings... button (3-D button bar) along the upper edge of 3D window.
2) Select the Options tab. Doubleclick on the Background field and select the color desired.
3) Close the Rendering Settings dialog box.

Measuring models

Background information

Measuring 3-D models

Interactive-measurement commands for the 3D window are located at Measure > 3D-Measurements.

Interactive measurement functions

Various geometrical parameters of the model surface can be measured:

- absolute position of a point on the surface (x,y,z)
- distance between two points on the surface
- height distance (z1-z2)
- polygonal length
- polygonal perimeter ([Shift] + polygon length)
- area

Activate the 3D window to conduct your measurement and then select the command desired. You define all measurement points interactively on the surface of the model.

Measurement results

- The results are written into a measurement sheet.
- Point markers and connecting lines are shown in the view area to indicate measurements of distance, height distance, position and polygonal length.
- Points and lines are not a part of the 3-D model and thus not saved along with it, but instead, along with the sheet. Points and lines can be hidden/ shown at any time. 3D views including points and lines can be archived by copying a particular 3D view area into an image buffer and then saving that image.
- Cyclically-varied colors are used for displaying distance, height-distance, position or polygonal-length measurements (of a measurement series) in the measurement sheet and the view area.

Deleting measurement results

Points set erroneously can be deleted from the 3D window and from the sheet successively: press [Shift] and then leftclick to do this.

Warning

In order to attain accurate measurement results, the height map must be calibrated correctly (X-, Y- calibration and image intensity calibration).

Step-by-step

How to measure length (or distance, height distance and position)

1) Enlarge the 3D window as well as the model so you can define measurement points as precisely as possible. Leave some space along the lower edge of the Graphical User Interface (GUI) to be able to see the measurement sheet during measurement.
2) Select the Measure > 3D-Measurements > Polygon Length command to define and measure an arbitrary polygonal length.
   ► Your image analysis program will create a new measurement sheet called 3D-Polygon Length. The mouse pointer will appear in the 3D window. Points and lines of any previous measurement will disappear.
3) Use the left mouse button to define the polygon's points to be measured.
   ► The status bar will show the coordinates of the point last clicked on.

- ► Straight lines (through three-dimensional space) join the points defined. To measure a length along the model's surface, define many, closely-positioned points.

4) Any points set erroneously can be deleted one at a time (successively). This is done by pressing [Shift] and leftclicking.

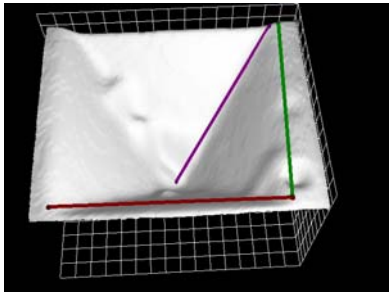
5) If you need to move the model surface while defining your polygon length, you may do so using the following:

[Shift] + arrow keys	move rightward (or leftward, upwards, downwards)
[Shift] + [Page Up] ([PageDown])	reduce in size (or enlarge)
[Ctrl] + arrow keys	rotation/tilt to the right (or left, backwards, forwards)

6) Rightclick to terminate definition of the length to be measured.
   - Define more lengths (within the model) as desired. The colors used for displaying points and lines are cyclically-varied. Corresponding measurements in the measurement sheet are the same color.

7) After you have finished measuring, simply rightclick. Click on Yes to confirm.

Three distances measured within the pyramid-shaped indentation.



3D-Distances

	3D-Object	Distance	X1	Y1	Z1	X2	Y2	Z2
		µm	µm	µm	µm	µm	µm	µm
1	EFI_MAP	136.50	19.15	138.63	96.09	155.38	135.22	88.21
2	EFI_MAP	129.03	156.19	134.38	90.46	147.43	5.82	97.06
3	EFI_MAP	122.12	147.43	5.82	97.06	80.18	72.78	20.19

How do I accumulate measurement results?

1) Length measurements of different models can be written in one measurement sheet. First, load or generate another model. Then, activate the measurement sheet and select the measurement command.
   - ► The measurements you make now will be appended to the active measurement sheet. Current measurement results are the only ones shown in the 3D window.

Saving, showing/hiding measurement results

1) Measurement results are not saved with the model. They will be deleted when you close the model. To save the measurement results, you have to save the measurement sheet containing them.
   - Use the Measure > 3D-Measurements > Hide Measurement Results command to make measurement results disappear from view in the 3D window.
   - Measurement results currently hidden can be ‘re-shown’ at any time within the model being measured. Simply load the model, or activate the 3D window. Then load/activate the measurement sheet and select the Measure > 3D-Measurements > Show Measurement Results command.

Image Analysis

Phase analysis

Background information

Phase analysis

Phase analysis is a quantitative evaluation of area with regard to each separate gray value or color phase. The definition of numerous gray value or color ranges which are assigned to individual phases, is a prerequisite.

False-color display

False-color display is the visualization of gray-value images using colors that have nothing to do with what the actual object's colors might be. False-color display means that each gray value or entire gray value range is assigned to a certain color.
When you see a color palette in the image-monitor icon in the image buffer box, you know the image is a false-color image.

The order is important

Normally you begin by conducting phase analysis (Measure > Phase Analysis) and then color coding (Measure > Phase Color Coding). If you conduct color coding *before* phase analysis, you will have to reactivate the image buffer containing the original image (following color coding). Otherwise, the Phase Analysis command will be either not available (because color coding a gray-value image results in a false-color image) or it produces a result you cannot use (because color coding a true-color image results in a new true-color image for which the set thresholds are no longer applicable).

RGB and HSI color space

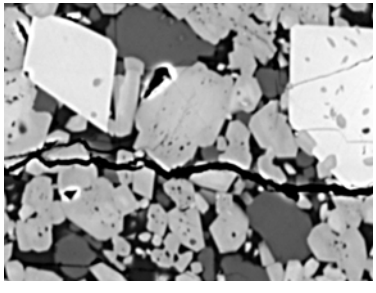
When defining thresholds for true-color images (in the dialog box for setting thresholds), phases can be defined for either the RGB (red/green/blue) or HSI (hue/saturation/intensity) spaces. Suitable phases are often easier to determine in the HSI space.

Step-by-step

Executing a phase analysis

1) Acquire an image of a multi-phase object which you wish to analyze. Or simply load an existing image.

Phase analysis will be conducted on a gray-value image as an example - but is equally applicable to true-color images as well. The dialog box for setting thresholds will look a little different - that's all.



2) Select the Image > Set Thresholds... command to define the gray value ranges for the separate phases.

3) Select the Auto Settings tab to have thresholds automatically calculated via the image histogram.

4) Click the Set ROI button to define a rectangular image area which will be evaluated for setting the thresholds.
   - Make sure that all relevant image information is included in the image area you define. The histogram in the dialog box will show the gray-value distribution within the area defined only.

5) Select the None option in the Background group to take all gray value ranges within the area defined into consideration.
   - When you do define a background, either the upper or lower gray value range is not taken into consideration.

6) Select the Fixed option in the Histogram limits group. Enter 0 into the Lower limit field; 255 into Upper limit (for 8-bit gray value images).
   ► This setting means that the entire image histogram will be considered for calculating thresholds.

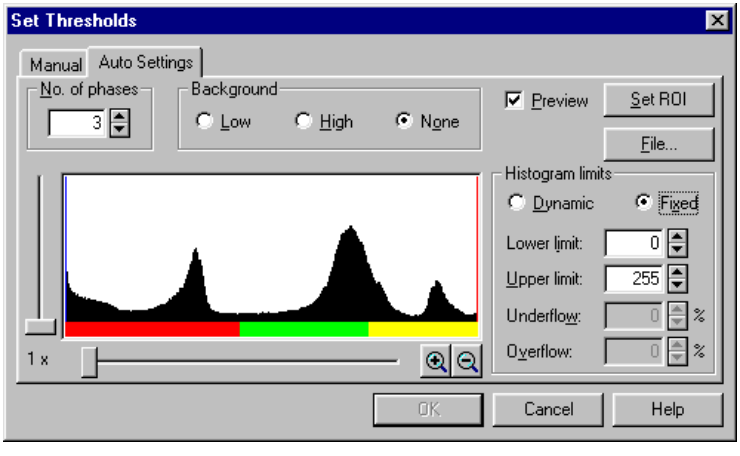
7) Enter the number of existing gray value phases into the Phases field. The example shown has 4 phases.
   ► Suitable thresholds are automatically calculated via the histogram. The color bar below the histogram shows the gray value ranges of each phase.

Warning

8) Select the Manual tab and click the Auto button to use the automatic thresholds.
If you do not execute this step, the automatic threshold values will not be used.

9) Confirm the thresholds you have set by clicking OK.

Phases can be automatically computed for gray-value images.



10) Select the Measure > Phase Analysis command.
   ► Your image analysis program will create a measurement sheet showing the absolute area and proportional area (in %) of all the phases.

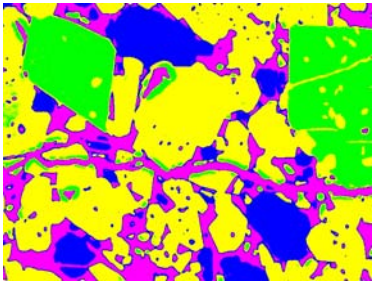
Phase analysis results appear in a measurement sheet showing the proportional area of each phase (in %).

Phase_Analysis

	Phase 1: 0 - 51	Area	Phase 2: 52 - 137	Area	Phase 3: 138 - 208	Area	Phase 4: 209 - 255	Area
	mm²	%	mm²	%	mm²	%	mm²	%
1	1059,21	14,85	1479,79	20,74	3078,78	43,15	1517,20	21,26
2	399,66	13,93	596,78	20,80	1323,42	46,12	549,58	19,15
3	845,20	14,77	1239,55	21,67	2472,04	43,21	1164,29	20,35
4	775,94	13,56	1179,44	20,62	2592,94	45,32	1172,76	20,50
5	680,52	14,27	1099,23	23,05	2100,71	44,04	889,36	18,65
6	473,19	14,55	699,55	21,52	1645,41	50,61	433,28	13,33
7	441,52	13,58	645,05	19,84	1489,68	45,82	675,18	20,77
8	825,76	14,40	1315,63	22,94	2471,70	43,10	1121,89	19,56
9	494,86	14,04	729,95	20,71	1746,13	49,55	553,26	15,70

11) Select the Measure > Phase Color Coding command to generate a false-color image based on the gray value phases defined.
   - ► The false-color image will be written into the destination image buffer.
   - ► The color of the phase will correspond to the header color in the measurement sheet.

Each gray value phase is shown in a different color in the false-color image.



12) Now load the next image you wish to analyze.

13) Select the Measure > Phase Analysis command.
   - ► The thresholds currently set are still valid. Phase analysis will be conducted based on these thresholds.
   - ► The measurement values will be appended to the existing sheet.

Detecting particles

During an automatic particle analysis, your image analysis program automatically looks for particles on an image. The color or gray value is the criteria for the recognition of a particle. Therefore, in order to have a successful particle detection, the particles must clearly stand out from the background. All detected particles will be automatically measured. You can choose from a wide array of measurement parameters.

You must do the following steps when executing your first particle analysis:

- Set threshold value (see page 145)
- Define detection parameters and execute detection (see page 151)
- Select particle parameters (see page 153)
- Define classification schemes (see page 163)
- Classify particles (see page 163)
- Select parameters for a class measurement (see page 164)
- Export results

If you analyze similar images, the existing settings will be adopted. You can also save all the settings and thus use them again anytime. The number of steps for each detection afterwards is thus reduced:

- Setting thresholds

- Executing detection
- Export results

Image preparation

Background information

Shading correction

Shading correction is for equalizing non-homogeneous image background. This kind of image interference occurs, e. g., if image illumination is not homogenous during the acquisition of an image. Shading correction may be necessary before you conduct particle detection to ensure that gray or color values and image structures are clearly correlated.

Separating particles

Before particle detection, neighboring particles have to be separated so that each will be treated separately, and not several as one. Your image analysis program provides several possibilities here:

- **Oper > Morphological Filter > Separate Particles**
  The morphological filter is for generating separation lines. The filter can be used on a binary image with white particles on a black background. Any holes within particles will cause artifacts.
- **Oper > Filter > Separator**
  The separator is applied to the image directly. It outlines particles or areas that have the same gray or color value. The resulting image can be edited interactively after particle separation has taken place. You can also trace the lines (visually) using this filter.
- **Combining multiple filters**
  The original image of a typical particle separation is a binary image of white particles on a black background. Use the erosion filter to remove particle boundaries until all particles have been separated. Then have a skeletal framework of the image background calculated for offset correction. A logical AND operation between the resulting (skeletal-framework) image and the original image will result in boundary lines being drawn between the particles.

Color Separation

When working with true-color images: it is easier to carry out a particle analysis on the gray-value images of some images. In this case, as a preparation for the particle analysis, use the Oper > Color Separation > Intensity command to create a gray-value image from the true-color image. Do not use the Oper > Change Bit Depth > To 8 Bit, because this command alters the image information so that it is no longer suitable for a particle analysis.

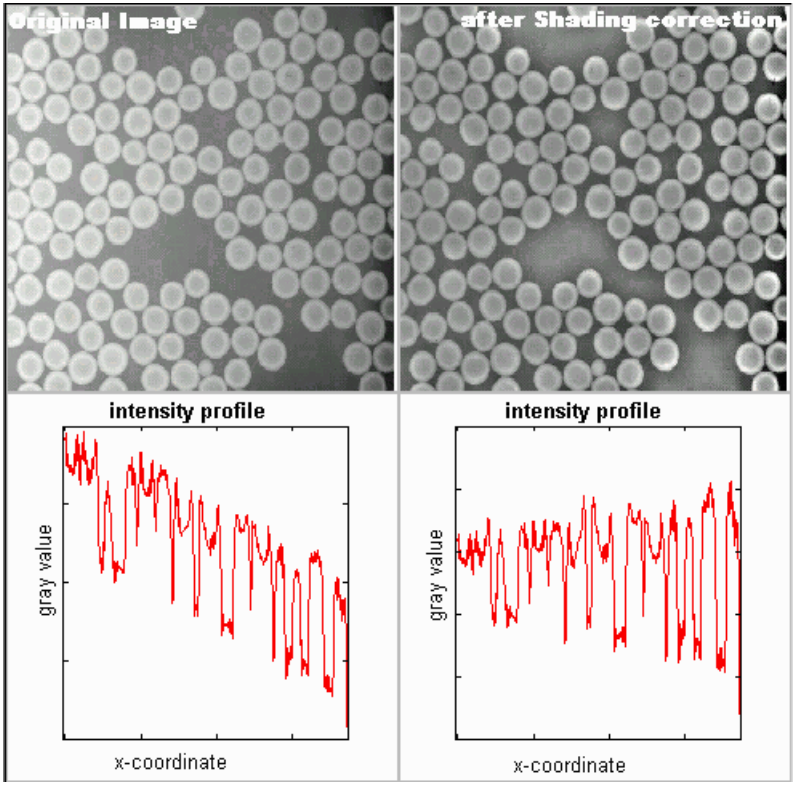
Step-by-step

Offset correction

1) Load the image you wish to correct into the active image buffer.
2) Select the Oper > Define Shading Correction... command.
3) Click the Window button to define the image segment for the preview.
   - Use the left mouse button to set position and size of the preview window. Rightclick to confirm your settings.
   - ► The Preview check box will be selected. The preview will then continually show how parameter alterations affect the image segment.

4) Select the Multiplicative option in the Assumed deterioration group.
5) Select the Source 1 option in the Source for shading image group to have the correction image calculated based on the image being corrected.
6) Select the NxN average filter in the Preparation of shading image group.
7) Set the parameters for this filter in the NxN average filter group: e. g., set the number of iterations to 3 and the size of the filter matrix at 50.
   - Should you be working with true-color images, select the Polynomial fit command.
8) Click the Execute button to apply shading correction to the image.
   ➤ The corrected image will be written into the destination image buffer.
   - You have thus also defined parameters for further shading corrections. Simply select the Oper > Shading Correction command to conduct them.

The upper-left image shows spherical polystyrene structures. Both the spherical structures and image background get darker looking from left to right. It is therefore not possible to set thresholds only for particles. After shading correction (upper right), image illumination is even and thresholds can thus be set.



Separating particles automatically

1) Set the zoom level of the image in the viewport to 100%.
2) Select the Oper > Define Filter Separator... command.
3) Select the Step option in the Boundary shape group.
   - The particle separator can also be used to track bright or dark lines. Select the Dark or Bright option in this case.
4) Set both Smooth and Fine/Coarse slide controls to 1.

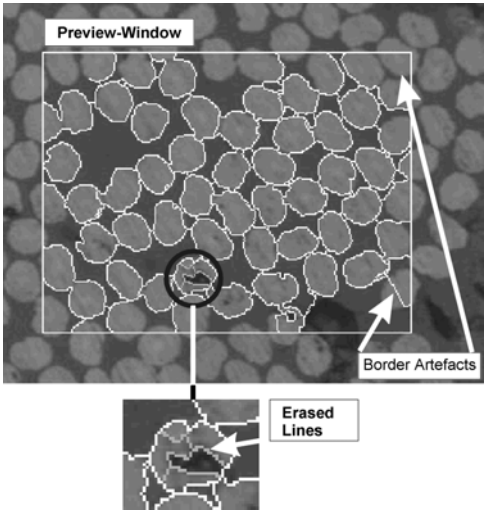
5) Switch on the preview to be able to observe how adjusting settings alters the image.

6) Move the Fine/Coarse slide control incrementally higher until you have found the optimal setting.
   - ► If an image has a lot of noise, increase the value Smooth.

7) Select the Burn black option in the Result group to be able to sketch black dividing lines on the original gray value image.

8) Click the Execute button to separate particles.
   - ► The resulting image in the target image buffer will display the image with the particles outlined in black (a gray value of 0).
   - ► The separating line generated has a width of one pixel.
   - • Please keep in mind that the gray value range which defines the particles must not contain a gray value of "0".

The separator calculates a separation line between gray value phases. Artifacts will occur on the borders and also around holes within the particles. These errors can be corrected interactively.



Setting thresholds

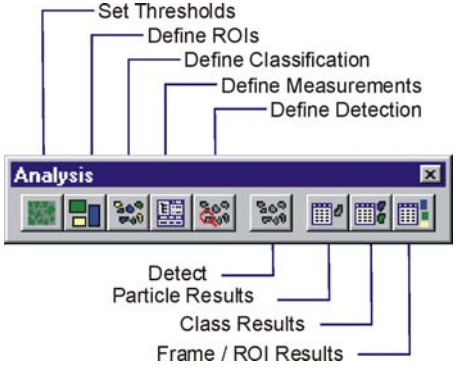
Background information

Particle

A Particle is a quantity of connected pixels within a defined gray value range. This is why you must define a suitable gray or color value range before every particle detection.
Successful particle detection requires a clear correlation between gray or color values and image structure.

Analysis button bar

The fastest way to access functions for analyzing is using the Analysis button bar. To have it displayed (just like for any other button bar) select the Special > Edit Button Bars... command. Then simply select the check box for the Analysis button bar from the button bar list.



Setting thresholds

Before beginning automatic particle detection, set the gray value/color-value range to define the particles so that they are distinguishable from image background. Defining this range is referred to as setting thresholds. The thresholds are comprised of the lowest and greatest gray/color values. There are two ways to set thresholds for gray-value images:

- Set the threshold values in the histogram interactively (Set Thresholds > Manual tab).
- You may also have threshold values calculated automatically from the histogram (Set Thresholds > Manual tab, Auto button).

When using color images, you define the threshold value interactively in the image.

Histogram

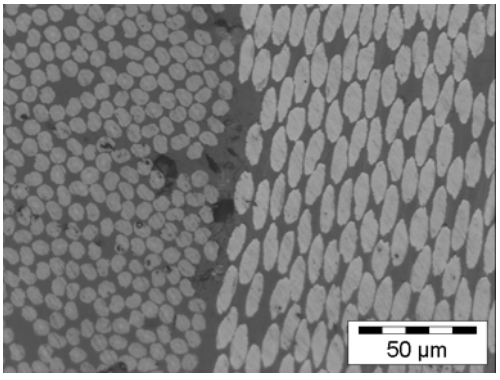
A histogram displays the number of pixels versus the corresponding gray values. You use this gray-value distribution of the image to define the gray-value range for particle detection.

Step-by-step

Setting thresholds

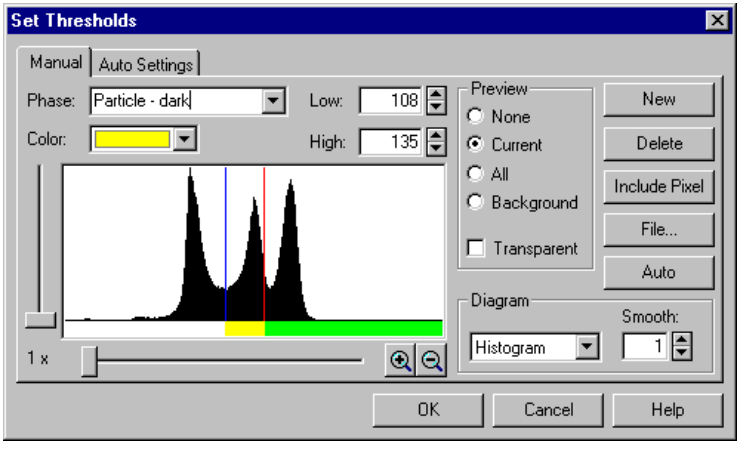
1) Load the image you wish to analyze into the active image buffer.
   - The following description of the particle detection is based on an 8-bit gray-value image.

Cut ends of carbon fibers are shown in the image above. The fibers' gray values depend on the angle of the cut.



2) Select the Image > Set Thresholds... command.
   - When analyzing true-color images the Set Color Thresholds dialog box will be opened. The two dialog boxes (for either true-color or gray-value images) differ considerably from one another.

In the example shown, the histogram (below) has three gray value peaks that clearly correspond to image structures: The dark background is somewhere in the vicinity of the gray value of 85. The gray values of the particles are correlated with their forms: the lighter particles have a gray value of about 153; the darker ones around 130.



3) Select the Manual tab.
   - The bar below the diagram shows you how many gray value ranges and/or phases are defined. Each phase has its own color.

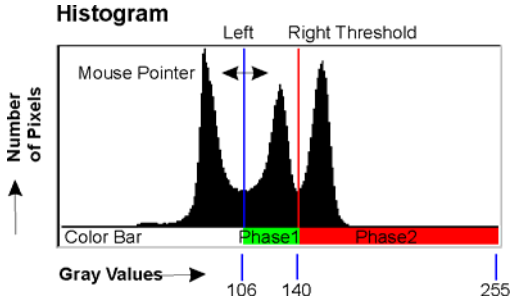
4) Delete all phases already defined except one.
   - To do this, select an entry from the Phase list and click the Delete button. As soon as only one phase is defined the Delete button will become inactive.

5) Select the Histogram entry from the Diagram group.
   - ► The diagram now shows the gray-value distribution within the image frame you have set.
   - The current threshold values are shown in the diagram as two perpendicular lines. The lower threshold is blue and the upper is red.

6) Mark the Current option in the Preview group.
   - ► The active phase is shown in color within the image so that you can view what affect your settings have.

7) Define the gray value range for the first phase directly in the diagram. Define the gray value range such that all particles belonging to that phase are shown in color.
   - ► Move the mouse pointer over one of the two threshold lines. The mouse pointer will change into a double arrow. Hold down the left mouse button and pull the threshold to the desired value. The set gray value range will be colored within the image.

Gray value ranges are set right in the histogram. The gray value ranges of the different phases appear in color within the image when setting thresholds.



8) Click the New button - to add a second phase.
   - ► A new entry will be added to the Phase list. The standard name can be substituted with any other you might prefer.
   - ► The new phase will automatically be colored in a color not yet taken. If you like, you can alter the color by selecting one from the Color palette.
   - ► The newly-added phase will now be activated - the diagram will now show the threshold values for the new phase. In the image, the corresponding gray values are displayed in color.
9) Define the gray value range for the second phase.
10) Confirm the new threshold setting by clicking on OK.

Defining detection area

Background information

The entire image is analyzed by default. Your image analysis program also provides various possibilities for restricting image analysis to a specific area within an image. You can set either frames, masks, or ROIs. You decide what detection area you use in the Define Detection dialog box.

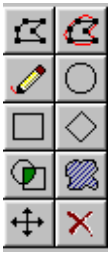
Frame

A frame limits image-processing and -analysis functions to a rectangular area within the image. This frame is a global setting and is then valid for all images loaded and several image analysis functions.

ROI

A ROI (Region Of Interest) is an area of arbitrary shape within the image. It must be defined for each image. ROIs are only valid for particle analysis. ROIs can, however, be transferred into a mask and thus be used for other image-analytical functions. To transfer a ROI, select the Analysis > Draw ROIs > Into Mask command.

The Define ROIs dialog box provides you with tools for defining and managing ROIs.

drawing a polygon		drawing an interpolating polygon
drawing a polygon freehand		drawing an ellipse +[Shift]: drawing a circle
drawing a rectangle		drawing a rectangle of arbitrary orientation
combining two ROIs into one virtual ROI		ROI based on a detected particle
Shifting ROI selected from the active ROI list		Deleting ROI selected from the active ROI list

Mask

A Mask is a binary image which can be superimposed on the original image for image-analytical operations. The mask has to be loaded into the mask image buffer. Only those image areas which are covered by the white areas of the mask will have the operation applied to them.

Activating a mask

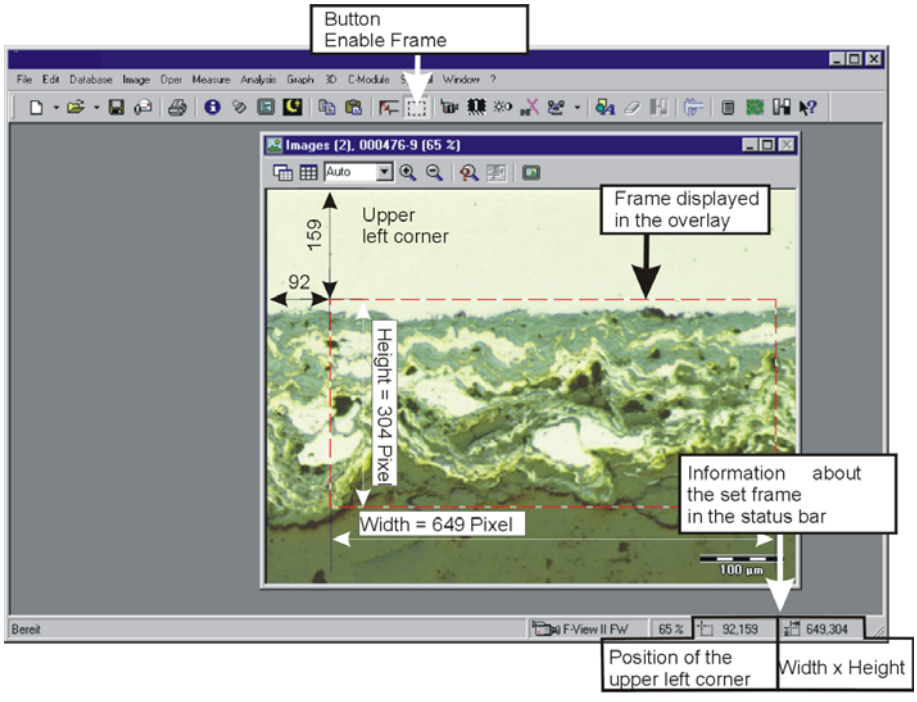
- **Image analysis**: to use a mask for image-analytical operations, the mask has to be activated. This is done by rightclicking on the Mask operand in the operands box of the image manager. Select the Enable Mask command in the context menu that appears.
- **Detection**: a mask does not have to be active (or 'enabled') to use it for particle analysis. All you need to do is select the Mask option in the Define Detection dialog box.

Step-by-step

Setting a frame

1) Select the Image > Set Frame command.
   - ► A red rectangle will denote the current frame in the image overlay.
   - ► The pointer is attached to the lower right-hand corner of the frame.
2) Press the left mouse button and pull the lower right-hand corner of the frame until you reach the desired frame size.
3) Move the frame to the desired position in the image.

4) Click the right mouse button to set the frame.
   - ► As long as a frame is active the Enable Frame button will remain depressed in the Standard button bar. Press this button to turn the frame on or off.
   - ► The size and position of the current frame will be displayed in the status bar.



Defining ROIs

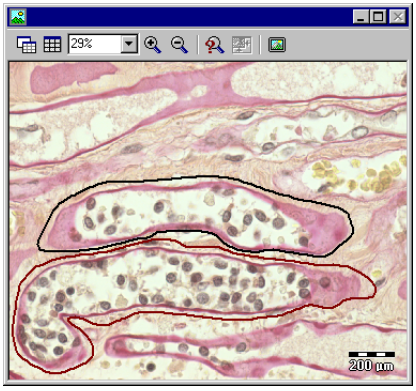
1) Select the Analysis > Define ROIs... command.
2) To delete previously-set ROIs, click the Delete All button.

3) Enter a name for the ROI into the Label field (e. g., 'Nucleus').
   - ► Any new ROI name will automatically be added to the Label list.
   - • Use the names of this list later on for other similar ROIs e. g., other cell nuclei. You do this by selecting the desired name from the Label list before you define a new ROI.

4) Select the method by which you wish to define the ROI in the Tools group. Click the Freehand polygon button to draw the image segment of interest freehand.
   - ► The pointer will appear within the image. While pressing the left mouse button, draw the ROI - e. g., the interior of a cell nucleus.
5) Rightclick to return to the dialog box.
   - ► The polygon figure defining the ROI will automatically be closed.
   - ► The new ROI will be numbered and added to the Active ROIs list.
   - ► Another color is automatically matched with each new ROI. The color makes it easier to identify the ROIs on the image.
6) Repeat steps 3 - 5 to define any further ROIs for this image.
7) Click the Save... button to save your defined ROIs for later usage with similar images.
8) Exit the Define ROIs dialog box via the Close button.
9) Use the Analysis > Draw ROIs > Into Overlay command to have the defined ROIs displayed in the overlay.

- Please note: if you make any additional changes to the ROIs now, the overlay will not be automatically altered accordingly.

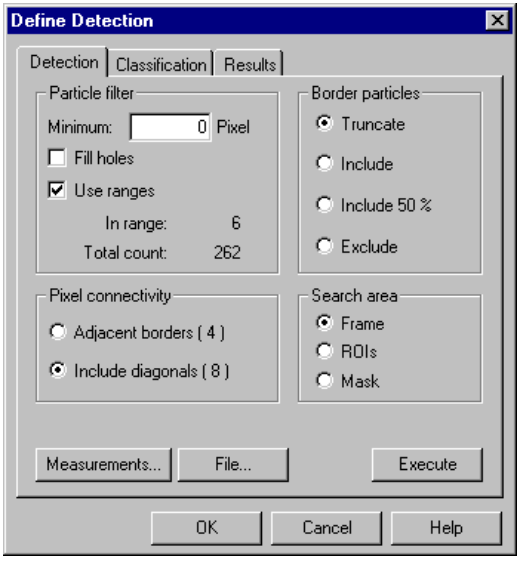
The example shows two ROIs defined and displayed in the overlay. During a particle analysis, the program only searches for particles within the ROIs.



Defining detection

Background information

You set the parameters for detection in the Define Detection dialog box. Most parameters are only set once, since they usually do not change for the same problems.



Excluding particles

Perhaps you are only interested in large and bright particles, or only particles that have at least one hole. Particle filters enable you to use particle parameters for excluding certain particles. You define a range for each parameter. Any particles that are not within the range defined will not be taken into account in the evaluation sheet.

Border particles

Border particles are particles that are not entirely within the detection area. There are four ways to treat these particles:

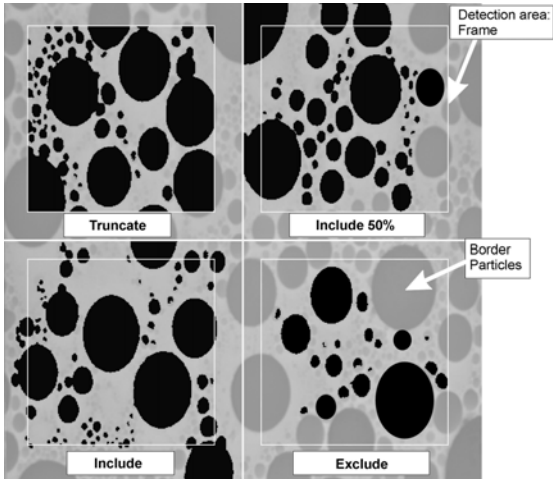
- **Truncate:** the particle is clipped by the search area (frame, ROI or mask) being detected.

- **Include**: the particle as a whole will be counted in the detection process if partially clipped by the frame or ROI.
- **Include 50%**: the only particles counted during detection are those in contact with the left or top frame border.
- **Exclude**: any particles touching the frame or ROI will not be detected.

Border particles can be treated in different ways during particle detection. All four of these options for dealing with border particles are only available when detecting via frames.

The Include 50% "option is not available for detection via ROI.

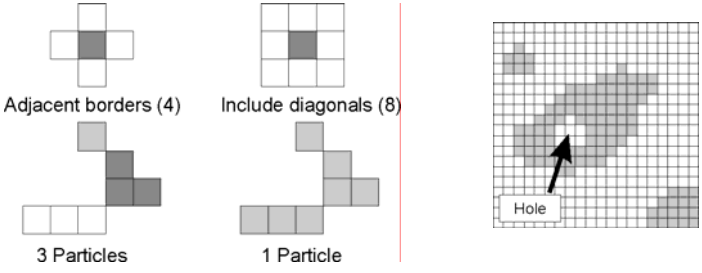
Border particles are always clipped when detecting via mask.



Pixel connectivity

- **Adjacent borders (4):** Two pixels belong to a single particle if one of their four sides touch.
- **Include diagonals (8):** Two pixels belong to a single particle if one of their four lateral edges or diagonals touch.

***left**: Pixel connectivity defines which pixels are considered part of a particle.*
***right**: Holes within particles can also be analyzed: include the holes in your detection and use the hole particle parameters (Hole Count and Hole Area).*



Holes

Holes are continuous gray value ranges within a particle, but are not part of that particle. These holes are either detected as such, or ignored. How holes are treated affects particle area.

Step-by-step

Defining detection

1) Select the Analysis > Define Detection... command.
   ► The Define Detection dialog box has three tabs for defining detection and classification parameters.
2) Select the Detection tab to set particle-detection parameters.
3) Enter the minimum number of pixels which may be detected as comprising a particle into the Minimum field of the Particle filter group.

Enter a value of 10 into the field, for example, to have only particles detected that have an area of at least 10 pixels or more.

► This is an excellent way to exclude particles comprised of very few pixels. Detecting these particles can be rather pointless. Entering, e. g., a value of 3 will exclude noise particles.

4) Clear the Use ranges check box to detect all particles occurring within the thresholds set.

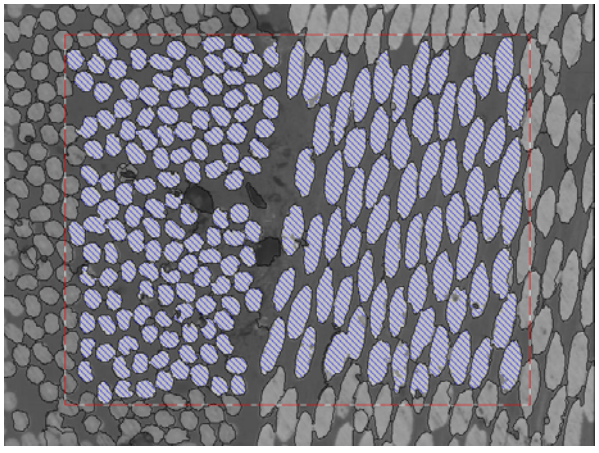
Warning

Please note: if the Use ranges check box has been selected the particle filters which were set for the previous analysis, will be applied to the current analysis.

- The Total count field shows the number of particles which were detected during the previously-conducted detection.

5) If particles have inclusions which are to be taken into account when calculating particle parameters, clear the Fill holes check box. This is necessary for particle holes to be recognized as such.
   - The Fill holes option affects, e. g., how particle area is calculated. The area of the holes will be added to particle area if holes are not recognized.
   - The Hole Count and Hole Area particle parameters (Define Measurements dialog box) refer to these holes in the particles. It only makes sense to use these parameters if the Fill holes check box has been disabled.
6) Determine the image area to be used for detection in the Search area group.
   Select the Frame option to detect within a rectangular image area. If a frame has not been set, detection will be conducted on the entire image.
7) Define how particles, which are not located entirely within the search area, are to be treated in the Border particles group.
8) Define inter-particle connectivity in the Connectivity group.
   - If the separation line between two particles is only one pixel in width then select the Adjacent borders (4) option. Otherwise the separated particles will be considered one particle when detected.
9) Click the Execute button to conduct particle detection.
   ► All particles detected will be shown in the image overlay in color. Determine how particles are shown in the Classification tab.
   ► The most recently-defined classification will be applied.
10) Click on OK to close the dialog box.

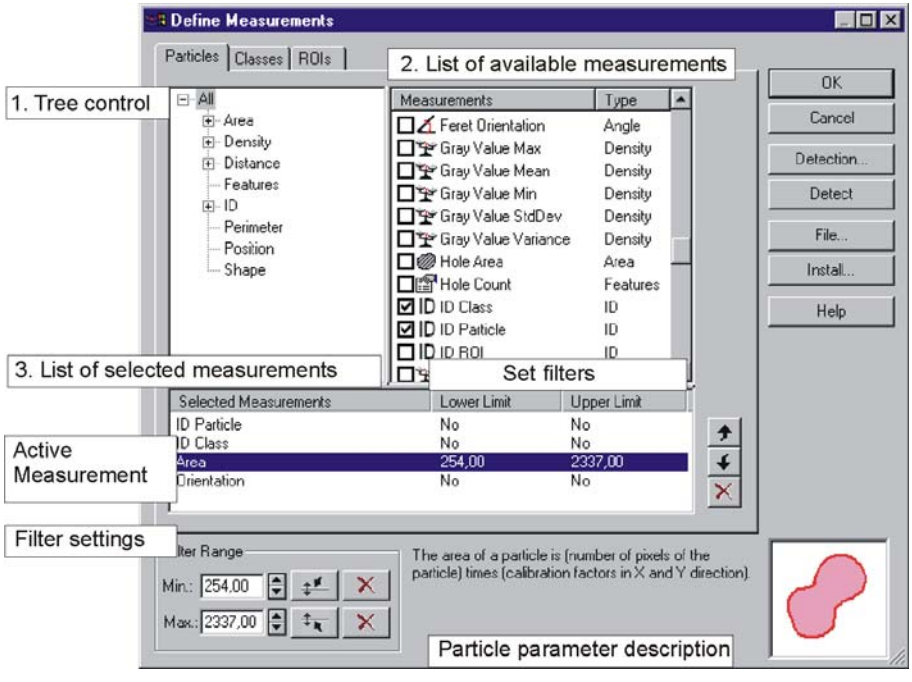
Detected particles appear in color in the image overlay. The most recently defined classification will be applied to the image. Any particles that cannot be classified will appear crosshatched.



Measuring Particles

Background information

The Define Measurements dialog box has three tabs for defining measurements of particles, classes and ROIs.



Dialog box properties

- You can make the dialog box as big/small as you wish: press the left mouse button while pulling an edge or corner of the dialog box in the direction desired.

- The three areas within the dialog box (1-3) can also be altered in size. What you can do, for example, is pull the separator between the tree view and the list of measurement parameters to the right (while pressing the left mouse button), giving you more space to view the tree view.

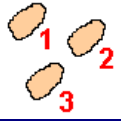
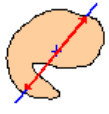
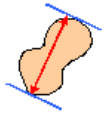
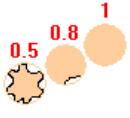
Measurement parameter structure

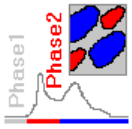
- All measurement parameters are arranged according to type in a tree view; e. g., the Convex Area parameter is in the same group with other parameters of area.
  Click on the Density group of parameters within the tree view, e. g., to list density parameters only.
- You can also rearrange the order in which measurement parameters are listed. Simply click on one of the two column headers to have parameters sorted alphabetically according to the header.

Particle parameter descriptions

Particle parameters are measurement quantities which can be measured for each detected particle. Image and text descriptions of all parameters are available within the dialog box. To view a parameter's description in the lower part of the dialog box, simply leftclick on it: e. g., the measurement parameter called Area.

The sheet lists some particle parameters from a total of about 100 possible ones.

particle parameter	type	Icon	description
ID Particle	ID		Unique ID number of the particle
Area	Area		Area of the particle in the unit of the current image calibration. The area is calculated by multiplying the number of pixels by the calibration factors of the X and Y axes.
Perimeter	Perimeter		The sum of the pixel distances along the closed boundary
Diameter Outer Max	Distance		The maximum diameter through the particle center from outer border to outer border
Feret Max	Distance		The maximum distance of parallel tangents at opposing particle borders
Shape Factor	Shape		A shape factor informs you how round a particle is. A shape factor of 1 is a circular particle: all other particles' shape factors are less than 1. The calculated shape factor can also be greater than 1 when dealing with very small particles which are only a few pixels in size. In doing so, we are dealing with a rounding error. You can preset the software so that results which are greater than 1 are automatically set to 1. To do so, use the Analysis > Define Detection... command. In the Results tab, select the Shape factor limited to 1 check box.

ECD (Equivalent Circle Diameter)	Distance		The ECD value is the diameter of a circle which has the same area as the particle.
Phase Name	ID		Name of the gray value or color-threshold range as defined in the Set Thresholds and Set Color Thresholds dialog box.
Hole Count	Features		The number of holes in a particle

Phases for particle detection

The particles detected are those within the gray value or color-value ranges defined. All phases that you defined via the setting of thresholds will be considered. This is why - when setting thresholds - you should delete any phases not needed for detection.

Particle-Sheet Link

The measurement sheet and the image of the detected particles will remain connected up until the next particle detection you conduct.

- To locate particles within the image according to specific particle results, simply doubleclick on the line's number which has the results of interest to you.
- To determine the measurement results for a particular particle within the image, select the Analysis > Particle-Sheet Link command.

Global settings

Select the Special > Preferences... command to adjust a broad range of program properties. The following settings are relevant for particle analysis:

- **Measurement sheets:** to alter font, font size, number of decimal places for measurement sheets go to the Sheet group of the View tab.
- **Overlay:** to set font size for particle parameters in the overlay go to the Overlay group of the View tab.
  Enter the number of decimal places particle parameters are to have in the overlay in the Measure tab.

Step-by-step

Selecting measurement parameters

1) Select the Analysis > Detect command to execute detection.
   - You do not need to select the Detect menu command if you have already executed detection via the Define Detection dialog box.

2) Select the Analysis > Define Measurements... command.
3) Activate the Particles tab to determine the particle parameters you wish to include in the measurement sheet.
4) Click on the top directory called All in the tree view on the left side of the dialog box to view all parameters listed alphabetically in the Measurements list.
5) Select the parameters desired: to do this, select the check box next to the parameter desired. It will then appear in the Selected Measurements list. All the parameters listed here will be included in the measurement sheet

subsequently.
Select the check boxes for Phase, Area and Orientation, for example.

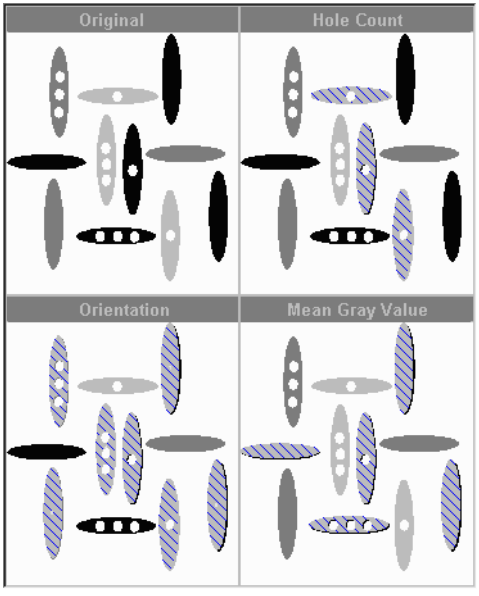
- ► The parameters selected will appear in the Selected Measurements list as well as for each particle in the results sheet.
  The ID Particle and ID Class parameters must be included in the results sheet to ensure that particles and particle parameters are clearly correlated in the image overlay.

6) Click on OK to confirm selection of measurement parameters.

7) Select the Analysis > Particle Results command.
   - ► A sheet which contains all of the detected particles of the selected measurement parameters is created. The parameters are in the same order in the sheet as in the Define Measurements dialog box.
   - ► The measurements are exported in color in accordance to the current classification. All measurement values which belong to a class, are exported in the color of that respective class.
     To deactivate the coloring, clear the Analysis > Define Detection > Results > Use colors in sheets check box.

Defining particle filters

*The particles of the original image differ in orientation, average gray value and number of holes. During particle detection, these particles can be excluded using these very parameters. All particles located and analyzed via detection are shown crosshatched: In the **upper right** image, only the particles with one hole have been detected. In the **lower left** image only the vertically orientated particles have been detected. In the **lower right** image only the black particles have been detected.*



1) Activate the magnifier before defining the particle filters, so that even small particles can be identified well in the image: To do so, click the bottom most button in the viewport manager and select the first entry entitled Magnifier from the list of the available views.

2) Select the Analysis > Define Measurements... command.
3) Should no particles have been detected yet: In the Define Measurements dialog box, click the Detect button.
4) Select the parameter you wish to define a particle filter for in the Selected Measurements list: e. g., "Area".

- ► The Filter Range group will become active. The values in this group always refer to the currently-active measurement parameter in the list of selected measurements.

5) In the Filter Range group, click the Get Minimum button (next to the Min field), to determine the minimum particle value.
   - ► The pointer will appear within the image.
6) Leftclick on a typically small particle which should still be detected.
   - ► All particles whose area is smaller than the selected particle are shown in the overlay as hatched. The hatched particles are no longer taken into consideration when the results are exported.
7) Check to see if only the particles with the desired area are detected:
   If you still are not satisfied: Add the excluded particles again by clicking on an even smaller particle now displayed as hatched. Or, you exclude even more particles from the detection by clicking on a larger particle.
8) Rightclick to return to the Define Measurements dialog box.
   - ► The interactively found limits for the particle filters are displayed both in the Filter Range group, as well as in the Selected Measurements list.
   - ► The Use ranges check box will be selected in the Define Detection dialog box.
   - • If the particle filter selected does not yield the results desired, select another filter. The result of the modified filter is immediately shown on the image.
9) Now you can define particle filters for other measurement parameters without having to exit the dialog box. The separate filter criteria will be connected via a logical AND operation in order to further restrict the number of particles detected.
   - ► Please note: All filtered particles completely disappear from the overlay, as soon as you have selected another particle parameter.

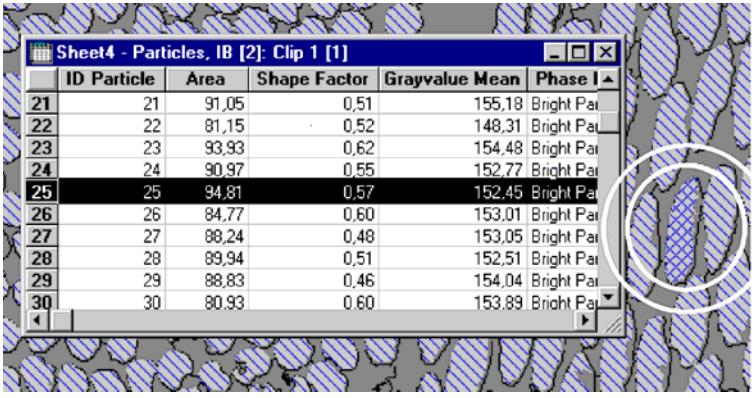
10) In the Filter Range group, click the Reset Maximum / Minimum button to deactivate the particle filter for the active measurement parameter.
11) Click on OK to terminate definition of measurement parameters.

12) Select the Analysis > Particle Results command.
    - ► The measurement sheet now only contains the particles which are located within the defined particle parameter.

Identifying particles that have specific values

1) Select a column of the results sheet and rightclick.
2) Select the Sort Descending command in the context menu to have measurement results sorted according to their numeric value.
3) Doubleclick on the line number of the first line in the sheet to locate the particle within the image that has the greatest measurement value.
   - ► That particle will start blinking in the overlay.
4) Select the Analysis > Particle-Sheet Link command.
   - ► The pointer will appear within the image window.
5) Leftclick on various particles - one at a time.
   - ► The sheet lines with the results of these particles will appear selected.
6) Rightclick to end the Particle-Sheet link.

The values of the current results sheet are linked to the particles in the overlay. Have particles of a specific value range shown in the overlay. The selected particle is particle number 25. The particle's area is ca. 95 m^2. The particle's average gray value is 152. The particle is within the 'Bright' phase.



	ID Particle	Area	Shape Factor	Grayvalue Mean	Phase I
21	21	91,05	0,51	155,18	Bright Pa
22	22	81,15	0,52	148,31	Bright Pa
23	23	93,93	0,62	154,48	Bright Pa
24	24	90,97	0,55	152,77	Bright Pa
25	25	94,81	0,57	152,45	Bright Pa
26	26	84,77	0,60	153,01	Bright Pa
27	27	88,24	0,48	153,05	Bright Pa
28	28	89,94	0,51	152,51	Bright Pa
29	29	88,83	0,46	154,04	Bright Pa
30	30	80,93	0,60	153,89	Bright Pa

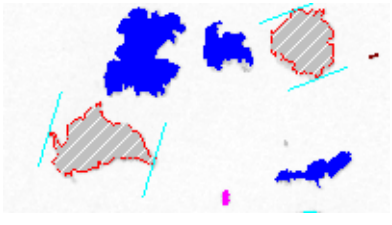
How can I detect one result at a time?

1) Select the Analysis > Single Result command.
   - ► The pointer will appear within the image window.
   - ► The particles you detect will be shown in the image overlay.
2) Leftclick on the particles you wish to measure.
   - ► The measurement parameters selected in the Define Measurements dialog box will be entered into a measurement sheet.
     If a particle-results sheet is already active, your image analysis program will append a single result to that sheet. A new sheet will be opened if this is not feasible.
3) Rightclick to terminate measurement.

Showing measurement results

1) Select the Analysis > Define Measurements... command to add the "Feret Max" particle parameter to the list of measurements.
2) Select the Analysis > Single Result command while pressing [Shift].
3) Leftclick on the particles of interest to you.
   - ► Your image analysis program will show the measurement parameters selected in the overlay.
4) Rightclick to end the export of the measurement results.

The "Feret Max" parameter shows the particle contour and the tangents which are relevant for the parameter's calculation.



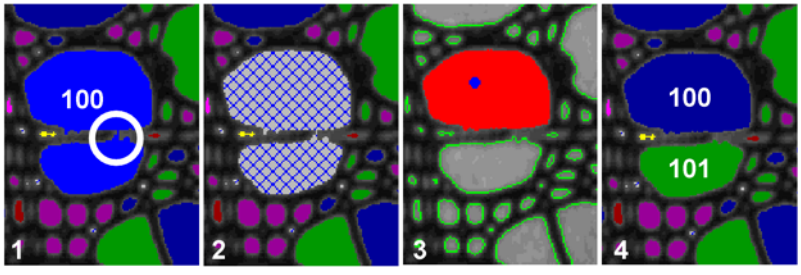
Editing detection interactively

Background information

Use the Analysis > Delete Particles and Append Particles... commands if some particles have been improperly or not at all detected.

Example for editing a particle detection

Following automatic setting of thresholds, two particles, for example, touch one another at the marked section and are detected as one single particle (figure 1).
The Analysis > Delete Particles command eliminates the wrongly-detected particle (figure 2).
Use the Analysis > Append Particles command to add particles separately. The magic wand function is for setting thresholds for each of the two particles separately (figure 3).
Particles 100 and 101 will now be recognized as the separate particles they are. Because of their different shape they will be classified in different classes and thus appear in different colors (figure 4).



Warning

Please note that conducting another detection (following interactive editing) will overwrite the particles you added interactively, thus yielding the same results you had before editing. Therefore, the Analysis > Detect command should not be used again after editing a particle analysis interactively. You may, however, generate a results sheet for your measurement results and/or select new measurement parameters as these do not require further detection.

Warning

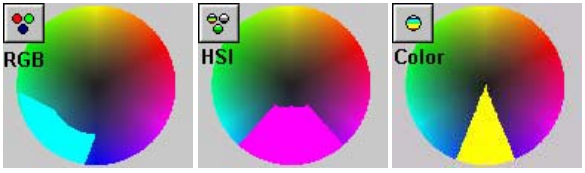
Please note: all the particle filters you have set also apply when you append particles interactively.

Magic wand

The magic wand is for setting different thresholds at different positions within the image, thus enabling you to define particles that would not otherwise be included in thresholds set for the whole image. All you do is select a point of reference within the image representative of the gray or color value of the image structure of interest. Use tolerance to set particle thresholds.

When using the magic wand, there are three buttons for determining the color space for true-color images via tolerance definition.
The tolerance value is added to/subtracted from the respective R, G and B values in the **RGB** color space.
The tolerance value is added to/subtracted from the respective H, S and I values in the **HSI** color space.
The tolerance value is added to/subtracted from the H value of the original image in the color space called **Color**.

The figures demonstrate how color space affects detection using the magic wand: tolerance and points of reference were the same for all three detections.



Deriving ROIs from particles

This is how you define ROIs using the magic wand: before conducting detection, use the magic wand to define the image area you're interested in as a particle. To include this particle in detection as an ROI, derive the ROI from the defined particle in the Define ROIs dialog box. Then you define the thresholds for actual particle detection using the ROI search area.

Step-by-step

Deleting Particles

1) Select the Analysis > Delete Particles command to remove falsely detected particles from the particle list.
   ► The pointer will appear within the image.
2) Leftclick on all the particles you wish to remove.
   ► The particles are shown in another color in the overlay.
3) Rightclick to confirm the particle selection.
   ► The deleted particles are no longer shown in the overlay and no longer appear later in measurement sheets.

Appending particles one at a time

1) Select the Analysis > Append Particles... command to add particles to the list of detected particles.
   ► All particles that have already been detected will appear as outlines in the image overlay for reference purposes. No matter what the current classification is, the color of these particles is always green.
   ► All other overlay objects will disappear from view.
2) Select the Fill holes check box in the Append Particles dialog box to have inclusions/holes within particles ignored.
   Clear the Outline check box to have appended particles shown 'filled in' in the overlay.
3) Select one of 7 methods of having particles drawn within the image overlay.
   Click the Magic Wand button, for example, to have the outline of a particle automatically calculated via the image's gray or color values.
   ► The pointer will appear within the image window.
4) Click on a gray or color value representative of that particle.
   ► The selected point of reference will be shown as a blue point in the image overlay.
   ► All pixels comprising the particle will turn red. The pixels comprising the particle are those connected to the blue point of reference within the tolerance range set. If, e. g., the point of reference has a gray value of 75 and Tolerance is 50, then all gray values from 15-125 are within the tolerance range.

5) To alter the point of reference, simply leftclick somewhere else within the image.

6) To increase the tolerance range simply move the mouse to the right while pressing the left mouse button.
To reduce tolerance move the mouse to the left while pressing the left mouse button.
The status bar displays the current tolerance value.

7) Rightclick to append the particle.

8) Use the magic wand to add more particles.

9) Rightclick twice to return to the Append Particles dialog box.

10) Feel free to select other methods of appending particles.

11) To successively delete appended particles one at a time simply click the Undo button. You may only remove particles as long as the dialog box is open.

12) Close the dialog box via OK to confirm the particles you have appended.
   ► The manually-added particles are now considered part of the current detection. There is no distinction made between particles detected automatically and those you have appended when measurement results are issued.

13) Select the Analysis > Particle Results command to generate a new results sheet including the appended particles.
If you have deleted any particles, their data will not be included in the sheet.

Classifying particles

Background information

Classification scheme

A classification scheme is comprised of a name, a unit and a class division. Particles are sorted via the classification scheme according to certain parameters. Particles can be sorted into 10 size classes, for example. You can determine the number of particles per size class, for example. You can also have the average gray values of all particles of a particular phase measured.

You define a new classification scheme in the Define Classification dialog box. You have numerous possibilities in opening the dialog box:

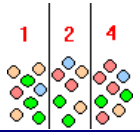
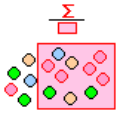
- Use the Measure > Define Classification... command.
- Click the Define Classification button located in the Analysis button bar.
- Use the Analysis > Classify... command. Click the Classification... button.

Automatic Classification

- When you load or acquire a new image your image analysis program will use the classification scheme last used. If you wish to use a different one then you may change it.
- Once you have conducted detection within an image your image analysis program will ‘remember’ the classification scheme that was used on this image in the previous detection. The next time you conduct detection with this image your image analysis program will use this same ‘remembered’ classification scheme. This is also true for images resulting from an image operation and which are based on the original image.

Class parameters

Class parameters are statistical quantities referring to all particles of a class. The sheet lists some classification parameters from a total of about 100 possible ones.

particle parameter	type	Icon	description
Particle Count	Features		the number of particles in a particular class
Area Ratio	Area		area percentage of all particles of a class relative to the search area (frame or ROI)
Area Class	Area		the sum of the areas of all the particles of a class
Area Mean	Area		the mean area of all particles of a class
Particle Density	Density		the number of particles of a class per area relative to the ROI area
Maximum/ Minimum Class	ID		upper/lower class limit of a classification; can be used to include a classification scheme in your results sheet

Particle display

To alter particle display go to the Define Detection > Classification dialog box. If you have selected No classification as your classification criteria then particle data will be shown without being classified.

Special > Preferences

Global settings for overlay display of interactive measurements are not relevant to automatic particle detection. There are, however, exceptions:

- **Decimal places** ('fractional digits'): enter the number of decimal places for particle measurements shown in the overlay in the Measure tab.
- **Font size**: font size for particle labels is determined in the View tab in the Overlay group.
- **Sheet**: the settings in the Sheet group also apply to particle results.

Editing overlay display

All results of a particle analysis which are written into the overlay can be edited just like any other overlay object. Simply disable the lock on the data layer so you can begin editing (Overlay > Layer > Lock Data Layer).

Define Detection > Results

The Define Detection dialog box has a third tab with general settings on how results are displayed:

- Have class results for each ROI computed separately (incl. separate sheets). This setting affects a number of class parameters.

- Values in the results sheet can be shown in the color of their respective class.
- You can have all shape factors greater than 1 set to 1.

Step-by-step

Defining a classification scheme

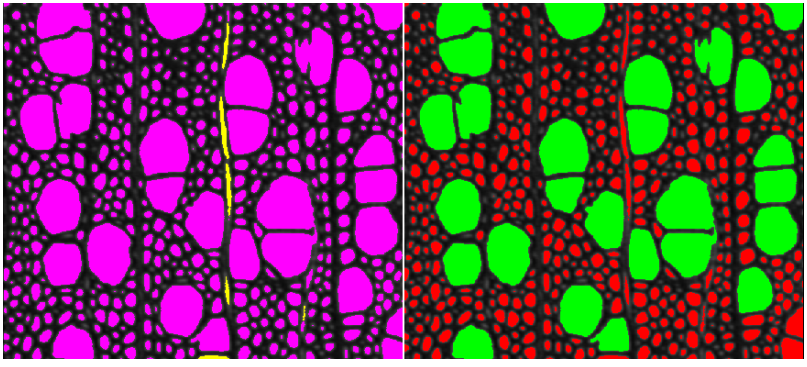
1) Select the Measure > Define Classification... command to define a classification scheme the way you need it.
2) Select the Show sample objects check box to be able to judge the size necessary for the classification.
   ► The current overlay will disappear from view and your image analysis program will show a number of sample objects for visual reference purposes.
3) Enter the name of the classification into the New Classification field.
4) Click the New button to create the new classification scheme.
5) Click the Unit... button to select the unit desired for the classification. The unit you select will depend on the classification criterion. If you're planning on classifying according to area, for example, you could select a unit of µm².
6) Click the Compute... button to define the number and value range of each class. The value range is determined by the minimum and maximum particle parameters.
   - If you have already detected an image, you can allow a suitable classification scheme to be automatically calculated: In the Compute Classification dialog box, enter the criteria and the amount of classes and click the Auto button.
7) Click the OK button to return to the Define Classification dialog box.
8) If you wish to edit the class divisions interactively, go to the Define Classification dialog box:
   - To alter the color of a class select the line number of that class and select one of the 16 colors available in the Set color color palette.
   - To give names to classes, leftclick in the Name field of the class Enter the class name into this field.
   - To interactively alter class divisions of a class, doubleclick on one of the numeric values and enter a new one.
9) Click on OK to exit the dialog box.

Applying classification

1) Select the Analysis > Classify... command to divide detected particles up into classes.
2) Select the particle parameter you wish to use to classify with in the Criteria list in the Classify group: e. g., "Area". The parameter you use to classify with is entirely up to you.
   - Select No classification in the list of classification criteria if you do not wish to have particles divided up into classes. The class parameters will then refer to all the particles that are detected.

3) Select the classification scheme you wish to use in the Class list. This list will show all classifications that can be used with the unit selected.
   - Should a suitable classification scheme not be available, click the Classification... button to create a new classification scheme or to edit an already existing one.
4) Click the Execute button to have the classification applied to the image.
   ► The particles in the overlay will be divided up into classes and shown in their class color. Any particles that do not belong to any of the classes will remain crosshatched.
5) If classification does not produce the desired results then feel free to try out other classification schemes before generating a sheet for your results.
6) Click on OK to close the dialog box.

The same image using two different classifications: Particles classified according to shape (left). The same particles classified according to size (right).



Shape_Factor

	ID Class	Particle Count	Mean Shape Factor
		#	
1		130	1,14
2	1	5	0,23
3	2	25	0,55
4	3	981	0,91

Particle_Area

	ID Class	Particle Count	Mean Area
		#	µm²
1		0	0,00
2	1	974	214,83
3	2	58	8254,25

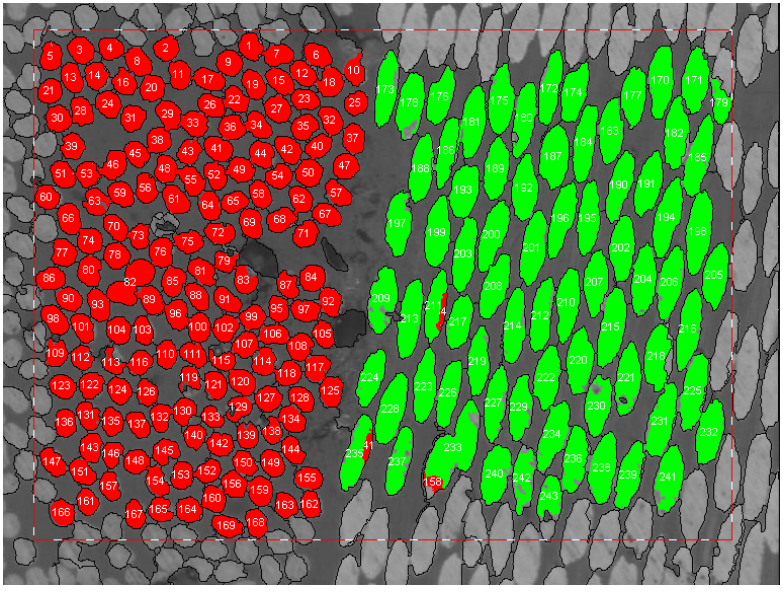
Select classification parameters and export results

1) Select the Analysis > Define Measurements... command.
2) Activate the Classes tab to determine the parameters you wish to include in the measurement sheet.
3) Select the parameters desired: e. g., ID Class and Particle Count.
   To do this, select the check box next to the parameter desired. It will then appear in the Selected Measurements list.
   ► The parameters selected will be moved to the Selected Measurements list and will appear in the results sheet for each class.
   - It is advisable to include the ID Class parameter in the results sheet to be able to see what results go with which classes.
   - The lower part of the dialog box shows a text and graphic definition of any parameter you select.
4) Click on OK to close the dialog box.

5) Select the Analysis > Class Results command.
   ► A sheet containing the results of the class measurement will be generated.

All particles which cannot be assigned to a class will be put in the "0" class and included in the sheet as well.

The carbon fibers are divided up into two gray value phases. The classification offers a results sheet with the following classification parameters: amount of particles, mean gray value and mean area of the particles in a classification.



Phase_Classification

	ID Class	Particle Count	Mean Grayvalue Mean	Mean Area
		#		µm²
1	1	101	153,42	80,90
2	2	209	126,12	33,02

Filtering class results

1) Click the Define Measurements button in the Analysis button bar.
2) Activate the Classes tab in the Define Measurements dialog box.
3) Select "ID Class" in the Selected Measurements list.
   Enter “1” into the Min field of the Filter Range group.
4) Click on OK to close the Define Measurements dialog box.

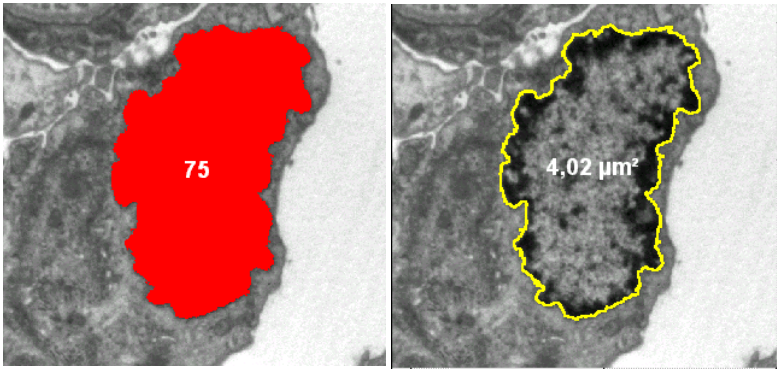
5) Click the Class Results button in the Analysis button bar to have the results shown in a new sheet minus the class "0" results.

Altering how measurement results are displayed

1) Select the Analysis > Classify... command to alter how detected particles are displayed.
2) Select Outline in the Particle outline group to have only the outline of the particles shown in the color of that class (instead of particles having a solid color filling). Crosshatched particles will have a white outline.
3) Define the kind of particle labels desired in the Measurement label group: select, e. g., ID Particles to display particles’ numbers in the overlay. Select None to cancel measurement labels.

4) Click the Execute button to have the altered settings transferred to the image.

Detected particles can be displayed in the overlay in various ways: (left) the particle appears in solid color; The value is the particle ID. The contour of the particle is shown to the right, together with the area value. To alter how particles are shown go to the Define Detection > Classification dialog box.



Possible stumbling blocks during a particle analysis

If the results of a particle analysis appear differently than what you had expected, check the following points:

Automatic Threshold Value

You can automatically calculate the threshold value for gray-value images.

- Automatically calculated threshold values are only then active, if you click the Auto button located in the Manual tab which is located in the Image > Set Threshold dialog box. The manually set threshold values remain active if the button is not clicked. Hence, not the desired particles will be detected.
- The background must be correctly defined during an automatic threshold setting. For example, if you would like to detect a light particle on a dark background, select the Background > Low option located in the Image > Set Thresholds > Auto Settings tab. If you want to detect a dark particle on a light background, select the Background > High option.
  Please note: The Background > None option should **not** be normally used for an automatic particle detection. In this case, all of the gray values of an image are matched to a phase and the entire image is detected.

Defining detection

No particles or fewer than expected have been detected:

- Clear the Use ranges check box located in the Analysis > Define Detection > Detection tab. In doing so, you deactivate the particle filter which is eventually still set from the last detection.
- Check to see if the area to be searched has been correctly defined. Select the search area Frame located in the Analysis > Define Detection tab and deactivate a possible frame. The program than detects the particle on the entire image.
  If the Mask option has been selected, the particle detection only then offers a result if a masked image exists.
- Select the Pixel connectivity > Adjacent borders option located in the Analysis > Define Detection > Detection tab. If the particles are separated by lines which are only one pixel in width, the Include diagonals option leads to the result that the particles are seen as one, even though the border exists.
- Select another handling of the border particles. For example, select the Border particles > Truncate option located in the Analysis > Define Detection > Detection tab. When using the Exclude option, it is possible that no

particle will be detected, because all of the detected image areas are connected. If the holes within a particle are not filled, such an effect is very difficult to recognize.

Classification

The detected particles are not sorted together with the defined classifications:

- Check to see if the current classification scheme uses the correct units. If need be, define a new classification scheme and use the automatic functions with which the classes are to be calculated from the image (see Defining a classification scheme 163).
- Check to see if you are using the correct classification scheme. Open the Analysis > Classify dialog box. The classification scheme utilized can be found in the Classification list.

Report Generator

What exactly does report generator do?

Automatic report generation
Use report generator to have multi-page reports produced practically automatically, including images of a database or of the image manager. Select a number of, (or lots of) images from an image database and have them all added to a report using a single command.

Full database-integrated access
Along with the images themselves that you get out of a database, you can have all additional information on the images (contained in database fields of image databases) automatically included in a report. Sheets with important measurement results can also be automatically filled in.

Working with images
A particular focus of report generator is being able to work with images in an optimal way: norm enlargements are followed; detail zooms can be inserted; appropriate image segments can be selected; and more.

Texts, Sheets, Diagrams, Graphs
Most types of documents that you generate within your image analysis program can be inserted into a report. Via report generator, you can, e. g., print out images along with related measurement sheets and diagrams on the same page.

Flexible Page Layouting
Report generator provides you with the most flexible page layouting imaginable: you set up your own template pages exactly the way you want them to be. You generate your template pages only once. These templates are the basis for your reports and ensure that the appearance of your documents is uniform.

MS Word compatible
Via the RTF Export function, you can have reports exported to MS Word 1:1. This enables you to communicate with fellow colleagues who may not have access to your image analysis program.

Creating reports

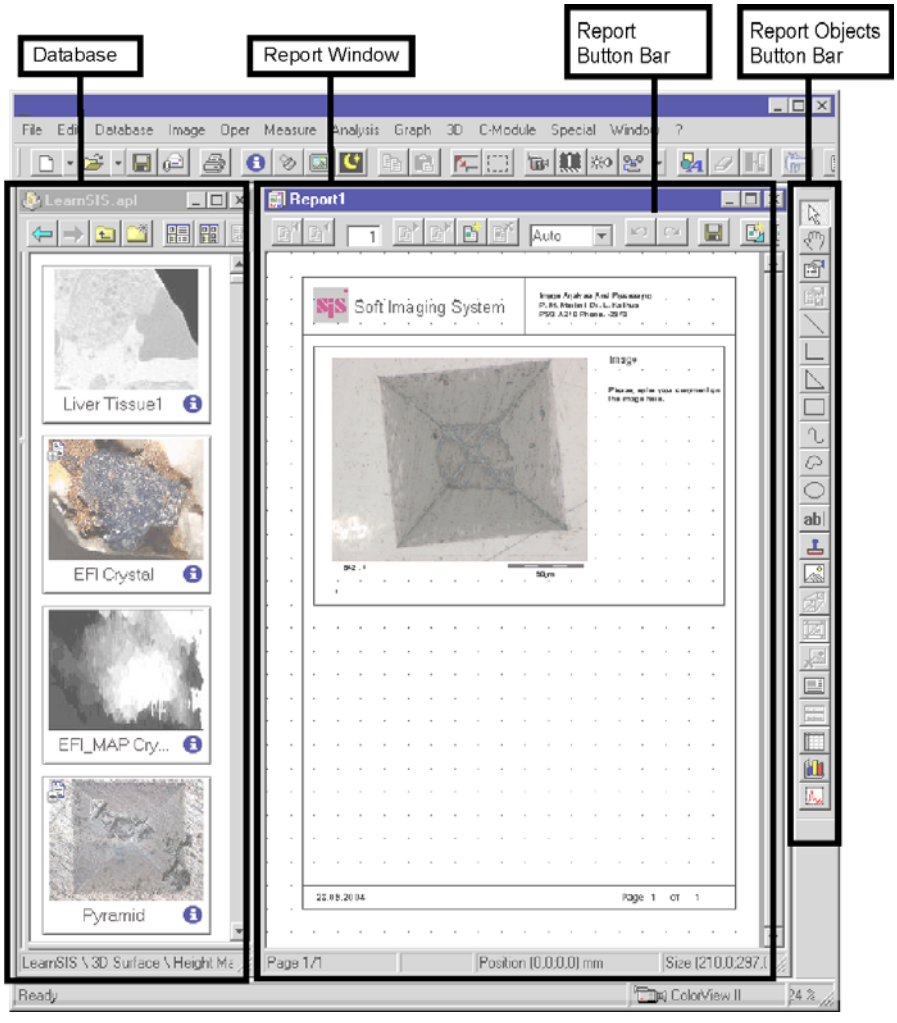
Background information

Reports and report templates
Reports are used to document results in standardized form. They usually consist of many pages which are similarly structured. In order to make report creation easier, a report is based on a report template. The report template defines all page layouts and object templates that can be used in this kind of report.

Report window
You can never load and edit more than one report (or report template) at a time. The report will be loaded into its own separate window. Only one report page can be shown and edited in the report window at a time. The report window has its own separate button bar and a status bar. There are ruled borders and a grid for use as positioning aids.

Related Topics
Exporting reports 172
Report templates 197
Ruler 175

Reports are opened within a separate window. The functionality of the report generator is in the button bars. The Report and Report Objects button bars are the two most important button bars.

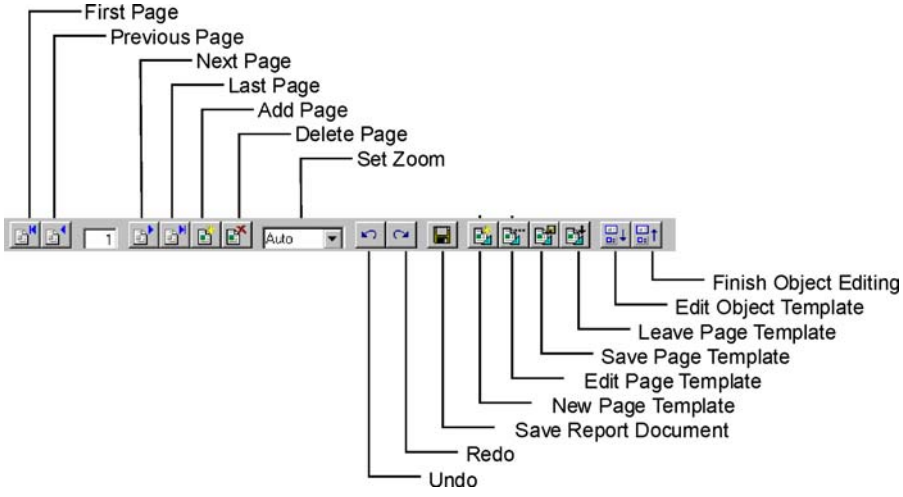


Report button bar

The report button bar is a part of the report window. Please keep in mind that these buttons' functions are not available as menu functions. This is why this button bar should remain visible. If you like, you can use the Special > Edit Button Bars... command to show or hide the button bar or to add other frequently-used buttons.

Turning button bars 'on' and 'off'

- Use the Special > Edit Button Bars... command.
- Rightclick in a report window. All button bars linked to report generator are listed beneath the Button Bars command.



Paging through a report

You can only display one page in the report window. Use the first buttons of the Report button bar to page back and forth through a report. When paging, the current report page will automatically be saved.

Go to

If you want to get to a particular page fast, enter the page number into this field and confirm via [Enter].

Add Page

Click the Add Page button to add a page to the active report (at any place). After clicking the button, select where the new page should be inserted. You can add a new page either in front of the active report page or at the end of the report.
You have to indicate a page template for each page. This determines the pages' appearance(s).
The newly-added page will become the active page, no matter what page was being shown before the new page was inserted.

Delete Page

Click the Delete Page button, to delete the report's page which is currently displayed in the report window. You have to confirm the deletion of a page. Any and all image files and thumbnails in connection with the page will also be deleted. Images inserted into a report as links will, of course, not be deleted.

Report properties

Define the page format for the current report in the Report Properties dialog box (Border and Format groups). In addition, determine some of the properties of the Graphical User Interface (GUI) (Grid and Ruler groups):
You can open this dialog box by rightclicking on any part of a report on which no object has been placed and selecting the Properties... command from the context menu.

File Format

The file formats SRD and SRC are available for saving reports. Both formats are exclusive file formats of your image analysis program and cannot be opened with other application programs.
Select the SRC file type to place all files which belong to the report in a single container file. If you insert a report in an image database, the report is automatically inserted in SRC format.
When using the SRD file type, the report is not saved in a single file. Similarly to the saving of a database, there are several files and directories involved. Any files that are part of a report will be automatically placed in a subdirectory named after the report. When making backup copies, the easiest thing to do is to copy the whole report directory.

Step-by-step

Set report properties

1) Leftclick anywhere within the report on the background.
   ► Now none of the report objects is selected.

2) Rightclick and select the Properties... command.
3) Select the desired properties for the report, e.g., page format. For example, clear the Snap to grid check box to be able to position all objects as desired via mouse.
4) Close the Report Properties dialog box via OK.

Generating a new report

1) Select the File > Report > New... command.
   ► The New Report dialog box offers you report templates that you can base your new report on.
2) Select the report template named "Normal" in the General tab in order to create an empty report.
3) The Report option is default in the Create new group.
4) Confirm via OK to have the report generated.
   ► The first page of the new report will appear within a separate window. The first page's appearance is determined in the report template.
   ► Your image analysis program will display a number of button bars to be used in making and editing reports. These button bars are context-sensitive, i. e., as soon as you activate another document the report button bars will disappear.

Adding pages to a report

5) Click the Add Page button in the Report button bar to add a page to the report.
   ► The Add Page dialog box will be opened. This is where you determine where you want to add a page within the report.
6) Select the Insert page option within the Add Page dialog box to insert the new page directly before the current report page. This is the option you choose if you have to add a page to a report that is finished otherwise.
   Select the Append page option to add a last page to a report no matter which report page is the active one or not.
7) Confirm by clicking OK.
   ► The Add Page Template dialog box is opened if the used report template contains more than one page template. You'll find all template pages that are defined in the current report template listed within the dialog box. Depending on the report template, you'll have very different page layouts available.
8) Select the desired page template and confirm via OK.
   ► You'll now see the newly-added page within the report window. The selected report template page influences the appearance of the page.
   ► The status bar shows the current page and the total number of pages the report has.
   ► The buttons for paging backwards or forwards are now available.

Saving a report

1) Press [F8] to open the Preferences dialog box and select the Report tab.
   - ► You'll find the standard path for saving reports and templates in the Directories group.
   - ► Your image analysis program will propose a standard directory for saving reports: the "Report" directory is a subdirectory of the root directory.
2) Enter the path name where you want to save your future reports into the Reports field, e. g. "C:\Reports\ProjectXYZ".
   - If the report directory does not yet exist, click the ... button next to the Reports field. Click the Create New Folder button in the Select Directory dialog box to set up the directory.
3) Confirm the new report path via OK.
4) Click the Save button in the Standard or Report button bars.
   - ► If you are saving the report for the first time, the Save Report Document dialog box will be opened.
   - ► Your image analysis program will propose the report directory called "C:\Reports\ProjectXYZ" in the Save in list.
5) Enter a content-relevant name for your report into the File name field.
6) Select the "report container (*.src)" from the Save as type list to save the report in a single file.
7) Click Save to save the report.

Saving / Exporting report

Background information

Rich Text Format The RTF format enables you to transfer formatted text documents between various programs that can be run on various platforms. You can save reports in an RTF format and then, e. g., load and edit them in MS Word.

- RTF reports are optimized for MS Word (MS Word versions 97 and later), i. e., the report's layout remains unchanged when loaded into MS Word.
- RTF reports cannot be reimported into your image analysis program.
- Images are always inserted into an RTF file as copies and not as links. This is always the case no matter how the images were inserted into the original report.
- MS Word can only display RTF files which can be edited in the layout or online layout view.

Step-by-step

Exporting reports

You want to send a report, e. g., by e-mail, to fellow colleagues that have no access to your image analysis program (or to the image files involved). In order to do this, you need a single, complete file that contains all data necessary to the report.

1) Select the File > Report > Export RTF... command.
2) Click the Browse... button next to the Destination file field.

3) Select the directory for the RTF file in the Save RTF dialog box. Enter the name of the RTF file into the File name field. Click the Save button to return to the Export RTF dialog box.
   ➤ The complete path and file name of the RTF file is now located in the Destination file field. Note that the RTF file has not yet been saved.
4) Determine the resolution of the images in the RTF file and thus the file size of the RTF file in the Reduce image data group. If you are planning on sending someone the report by e-mail, then it makes sense to keep file size as small as possible.
   Select the Use JPEG compression check box.
5) Enter 60 into the quality [%] field. This quality value determines the degree to which images are compressed (low percentages mean a correspondingly high degree of compression).
   ➤ The JPEG compression reduces the file size of an image but also generates typical image artifacts. The more you compress an image, the greater the loss in image quality. JPEG artifacts are generally not visible in a printout at 60%.
6) Initiate exporting by clicking on OK.
   ➤ The resulting RTF file you can now, e. g., load in MS Word or send to someone by e-mail. The layout of the report remains completely unchanged in MS Word.
   • The file size of RTF files can be very large. You can reduce the file size by saving the report in MS-Word as a Word document in DOC format.

Printing the report

1) Select the File > Print... command to print out the finished report.
   ➤ The Print dialog box is context-sensitive. This simply means that the functions being offered by the dialog box depend on what document is active. Before you print a report, you have to activate this dialog box.
2) Select the Full image option from the Images group within the Print dialog box.
3) Select the All option from the Print Range group to have the report printed out in its entirety. Start printing by clicking on OK.

Report objects

Background information

Report objects A report page usually includes various kinds of objects. These may involve image and text objects as well as graphic objects. For each object there are individual characteristics which can be defined, which are different for each object type. A certain object type, the record object, can consist of numerous other objects. You can define individual object templates for record objects. In doing so, you not only create a wealth of different record objects, but also guarantee a uniform appearance of the record objects in different reports.

Placeholder Several objects serve as placeholders. Image objects and record objects are typical placeholders. These objects are usually defined in a report template. If you then create a report based on this template, the placeholders are filled with concrete images

Related Topics
Record objects 181

or database information. Diagrams, sheets and single sheet cells can be defined as placeholders.
Use a placeholder's properties, e. g., size and position to define the properties of images or texts you wish to later insert into a report.

Background objects

Background objects are defined on the template page and appear on each page of the report which is based on this template page. A company logo, address, or frame are common background objects.

AutoText

AutoTexts are texts defined on the template page and which are updated for each new report page automatically. Creation date and page number are typical AutoTexts.

Selecting objects

You generally have to select objects first before you are able to edit them. Leftclick once on the object to select it. Selection markers indicate that an object has been selected.

Selecting several objects

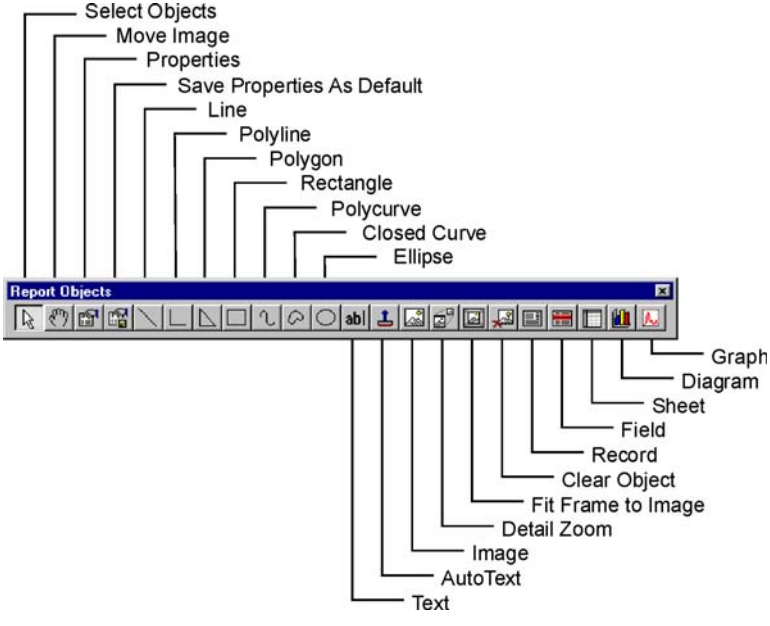
If you keep the [Shift] key depressed, you can select several objects. All objects you select will be indicated by selection markers: the last one you select has gray markers, and the rest white. Or, keep the left mouse button depressed, move the mouse to draw up a frame that encompasses all the objects you wish to select.

Object Properties

You have numerous possibilities to alter the properties of an object:

- Doubleclick on the object.
- Select the object and then click the Properties button in the Report Objects button bar.
- Select the object, then rightclick and choose the Properties context-menu command.

The buttons of the Report Objects button bar are for all report objects which can be inserted. This button bar is part of report generator and only appears when the report window is active. You will find the button bar on the right edge of the user interface by default.



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Size and position

You can alter the size and position of all report objects either in the object properties by entering absolute numeric values, or alter them directly with the mouse. You can use the ruled borders of the report window as positioning aids.

Altering object size via mouse

- Select the object - keeping the left mouse button depressed - and drag one of the selection markers in the direction desired. When simply altering size, the position of the selection marker opposite the one you have selected will remain unchanged.
- Press the [Shift] key when you move the corner point of an object via mouse if you want to keep the length/width ratio of the object frame the same.
- Press the [Ctrl] key to keep the center point constant when altering size of the object frame.

Altering object position via mouse

- Select the object. Move the object with the mouse by keeping the left mouse button depressed.
- You can also select and move more than one object at the same time. This means that the objects' positions relative to one another remain the same.
- To move a copy of the object - and not the object itself - press the [Ctrl] key while moving the object.

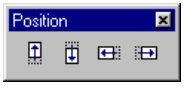
Positioning objects approximately

Use the mouse for an initial and approximate positioning of objects. Select one or more objects. You can pick up the selected object(s) by leftclicking and then, keeping the left mouse button depressed, you move the mouse to move the object(s) to where you wish to have it (them). Use the grid alignment to be able to position objects fast.

Fine-tuned positioning

- Select one or more objects and use the arrow keys (on the keyboard) to move the object in the direction desired. Press the [Shift] key to increase the distance moved (each time you press a key) from 0.1 mm to 0.5 mm.

Use the buttons of the Position button bar to fine-tune your positions.



- Select one or more objects and use one of the buttons of the Position button bar to move the object selected in the direction desired. Each click represents 0.1 mm.
- Select one or more objects and use the Position and Size tab if you wish to enter the position of an object as an absolute numeric value.

Positioning aids

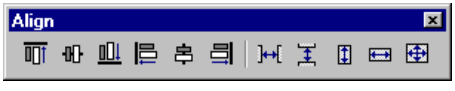
Status bar — When you select an object, its exact size and position will be shown in the status bar.

Ruler — When positioning or altering the size of objects, its dimensions and current position are shown in relation to the rulers of the report window. You can turn rulers 'on' or 'off' in the Report Properties dialog box. The unit of the rulers is also determined along with the report properties. The following units are available: cm, inch, mm and pt.

Grid — Use the grid as a positioning aid while inserting objects. You can display the grid in the report properties and alter its size. When inserting an object, it is automatically aligned on the grid.

Align button bar — Use the buttons on the Align button bar to arrange numerous objects relatively to one another. The position of the reference object is crucial for alignment. The reference object is the object you last selected. It's easy to recognize with its gray selection markers (any other objects have white selection markers). Position and size of the reference object is unaffected by operations conducted.

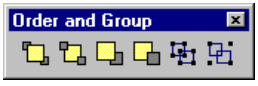
The buttons of the button bar are only active if numerous objects have been selected.



Mirroring You can mirror an object by altering the size of the object. Drag, e. g., the lower right-hand corner of a text or image object over the upper left-hand corner in order to invert the text or image.

Aligning overlapping objects Objects that overlap each other may partially or completely cover each other up. The object that was inserted last is generally in the foreground. You can, however, later alter the order of the objects. Individual objects can then be partially or completely placed in the background.

You will find the Order and Group button bar in the Button Bars menu located in the report window's context menu.



Step-by-step

Insert report object

1) Load an already existing report or create a new one.
2) Click on any position on the report page to activate the report window.
   - ► The Report Objects button bar is only displayed if the report window is active. You will find the button bar on the right edge of the user interface by default.
   - • The first button Select Objects of the Report Objects button bar is engaged by default. In this mode, you can select and edit as many objects on the report page as you like.

3) To draw a new graphic object click the corresponding button in the Report Object button bar, e. g., the Rectangle button.
   - ► Within the report window, the mouse cursor will now change shape - into a cross-shaped symbol - indicating that you may now define the object. Please note that no other action is allowed in the report as long as your image analysis program is waiting for the definition of an object. You will notice this mode by the fact that the object button located on the Report Objects button bar is now engaged.

4) Defined the object on the report page. For example, keep the left mouse button depressed and drag the rectangle to its desired size.
   - • Please note: Some objects might require numerous mouse clicks when defining them. End the definition of such an object by clicking the right mouse button.
   - ► The object is inserted as selected so that you can edit it right away. Once again, the Select Objects button, which is the first button on the Report Objects button bar, is engaged.
   - • However, you can alter the position and the size of the inserted object any time.

5) In order to format the object, rightclick and select the Properties... command.

Aligning objects in relation to one another

1) Show the Align button bar, should it not be visible.
   - • To do this, rightclick on any place within the report to open a context-sensitive menu. All button bars having to do with report generator are listed beneath the Button Bars entry. Select the Align button bar.

2) Position an object at the position desired within the report. This object is to be the reference object for the positioning of the other objects.

3) You now select the first object you wish to move in relation to another object.
   ► Gray selection markers will appear around the object selected.

4) Keep the [Shift] key depressed and select the reference object.
   ► Both objects now have selection frames around them. The selection markers of the object you last selected are gray and the other one's selection markers are white.

5) Use the first buttons of the Align button bar to align all objects that have white selection markers in relation to the object that has the gray selection markers. Click, e. g., the Center Horizontal button to move the object selected to the left or to the right until all center lines are in alignment - i. e., in the same position.
   ► Objects will only be moved to the edge of the page and no further.

Image Objects

Background information

Image object

You cannot insert images into a report directly. You have to first create an image object to define the size and position of the image as well as its properties. After insertion of the image object, the image object remains empty. You can identify an empty image object by the fact that the area reserved for an image is hatched.

Inserting an image object

Click the Image button located in the Report Objects button bar to insert an image object into a report.

Inserting images

Use the mouse to drag an image from the image manager or directly from an image database onto an existing image object. Keeping the left mouse button depressed, move the mouse onto the image object within the report window. When you release the left mouse button, the image will be assigned to the report document.

You can insert a number of images simultaneously into a report. Create a new report page that has at least one image object. Select the desired images in the image database or in the image manager and drag the selected images onto the first image object.
If the number of images selected is greater than the number of image objects represented on the current report page, your image analysis program will automatically add any pages needed. The added pages use the page template of the active page.

Warning

Please note that you cannot reload an image already inserted into a report into your image analysis program.

Sequence when inserting

The sequence of the images inserted into the report is determined by the sequence in which you select them from an image database. Mark the images in the order in which you want them to be inserted into a report. To do this, depress the [Ctrl] key and mark the images with the left mouse button. The numbers in the top right corner of each thumbnail represent the order of the selection.
The images from the image manager are always inserted in the sequence of the image buffers. The order in which they were selected is of no significance.

Image types

You can insert all image types which can be loaded by your image analysis program into a report.
Generally, the images are inserted into a report in the way they are shown in the image window. For example, this means that an 16-bit image is inserted into a report with the current display LUT.

If your image analysis program supports multidimensional image types, you will find an additional tab in the image properties which enables you to determine which dimensions are to be acquired in the report for an empty image object.

Print magnification

An image's print size within a report depends on the image object properties selected and on image calibration. The following is generally true:
print size = print magnification x image size

Print magnification

The print magnification is the absolute magnification at which the image is printed out on paper. Your image analysis program determines print magnification via the print size and the absolute image size.

Print size

The print size is the size the image is printed on paper. Without any automatic labelling, the print size of the image will correspond exactly to the size of the image object. If you have the magnification or the scale shown, the print size of the image will be less than that of the image object.

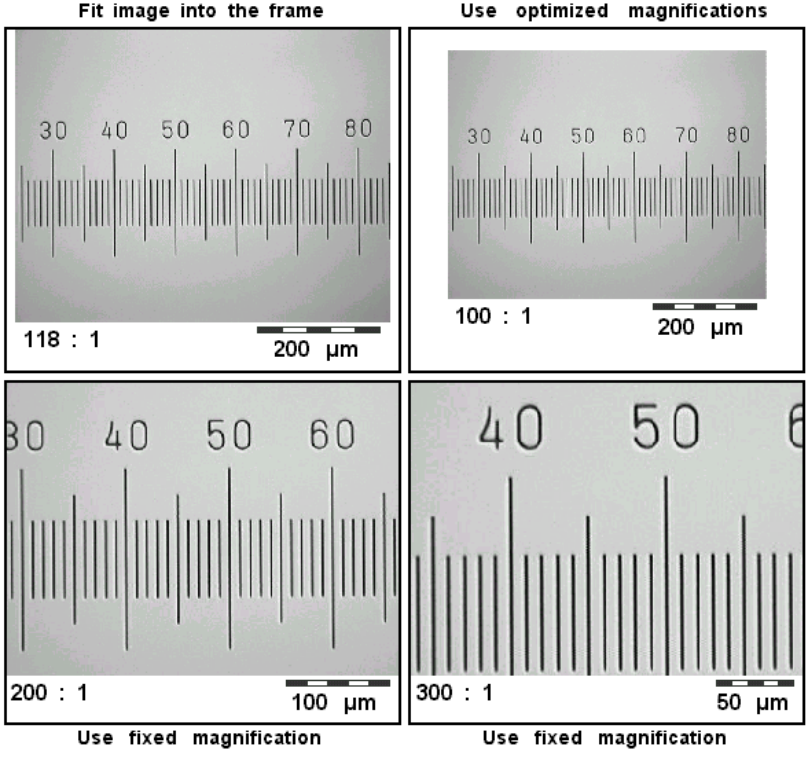
Image size

The image size is the actual size of the image. It is determined by image calibration. An image that is 500 pixels in width and calibrated at 0.5 µm/pixel has an absolute image width of 500x0.5 µm = 250 µm. Your image analysis program determines absolute image size via image information.

Rotate image

The report generator enables images to be rotated 90°. Rightclick in a report window. You will find the Rotate button bar under the Button Bars command. Mark the image object and select one of the two buttons to rotate an image 90° clockwise or counter clockwise.

The illustration shows the inserted image in three different available magnifications in the object properties. The image object is the same size each time. A frame indicates the size of the image object. There are two different predefined magnifications showing different image segments.

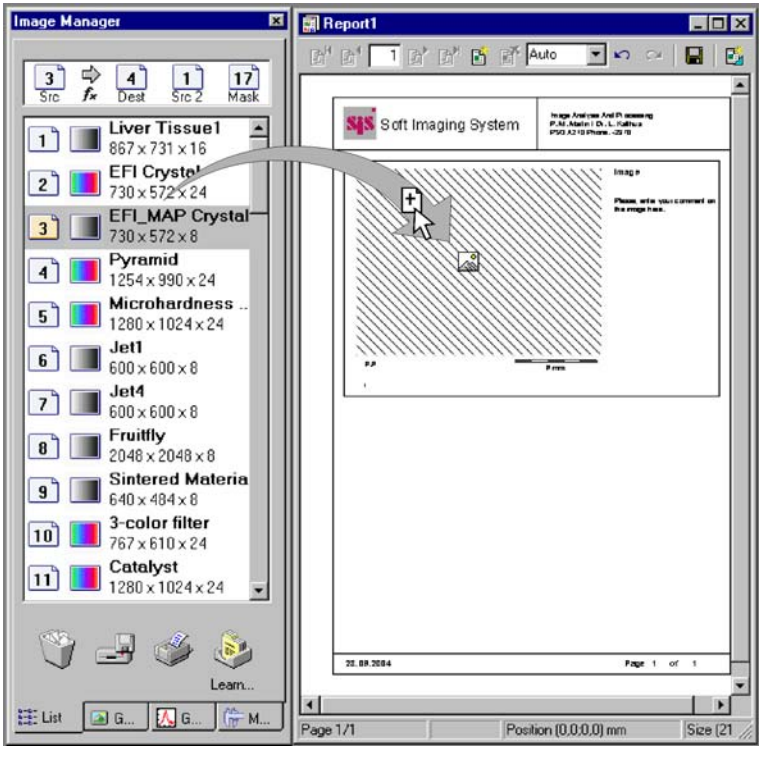


Step-by-step

Inserting images from the image manager into a report

1) Load the images that you want inserted into the report into the image manager.
2) Press [F8] to open the Preferences dialog box and select the Report tab.
3) You'll be making two fundamental decisions concerning how images are treated in the report in the Image group.
   - Create image copies: you decide whether images are to be saved along with the report or whether you'd rather insert them as a link to an existing image file.
   - Use thumbnails instead of full images: Select either a high-resolution image display or thumbnail. This selection only affects the display of an image on the monitor and not the image quality in the actual printout.
4) Click OK to close the dialog box.
5) Generate a new report based on the "Normal" template.

6) Insert at least one image object. To do so, click the Image button located in the Report Objects button bar.
7) Pull an image via drag&drop right out of the image manager onto the image object within the report.
   ► The image will be inserted into the report and shown in the report window.



Changing the print size of an image

1) In order to display an image at a different magnification level, select the image object by leftclicking on it.

2) Click the Properties button in the Report Objects button bar to alter any of several image object properties - especially, print size.

3) Click the Image Properties tab. This is where properties, specifically for image objects are made available. You can alter the image properties (that have been proposed within the report template) for individual images within a report at any time.
   - The Fit image into the frame option located in the Magnification group is set by default. Your image analysis program then calculates the most appropriate magnification based on the calibration data for the size of the image object.

4) Change the magnification option and select the Use fixed magnification option.
   ► The edit field suggests a magnification for each image with which the image can be completely displayed in the image object.

5) Enter various constant magnifications into the field and confirm by clicking Apply.
   ► The size of the image object is what determines the maximum print size of the image. The lower-left segment of the image is all that will be shown because the image is larger than the image object.
   - To move an image around within the frame click the Move image button in the Report Objects button bar.

6) Select the X check box located in the Scale group to include a scale bar underneath the image being printed. Select one of three possible scale bar types from the list. The length of the scale bar is calculated from the pixel calibration data of an image and automatically adapted for printing.

Warning The automatic scale bars are only accurate for images that are correctly calibrated.

Adding zoomed image segments (Detail Zoom)

1) Insert an empty image object.

2) Drag a large image either from the database or from the image manager onto the image object.

3) Select the image object and click the Detail Zoom button located in the Report Objects button bar.
   ► The pointer will appear within the report window. You are now only able to move the mouse pointer within the image object.

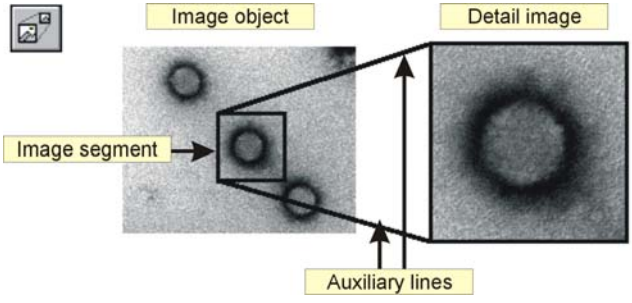
4) Now define a rectangular segment within the image.
   - Keeping the left mouse button depressed move the mouse to form a rectangle within the image. Release the mouse button once the rectangle is the size desired.
   ► Your image analysis program will select the image segment selected and will automatically add another image object showing the image detail selected.
   ► Auxiliary lines provide a visual guide from the corners of the detail image to the corners of the image segment making it easy to see the visual correspondence between the image segment and the detail image.

5) Changing the size and position of the detail image.

- In order to position the detail image you move the mouse pointer onto the detail image. As soon as an arrowed cross symbol appears at the mouse pointer you can press the left mouse button to pick up the detail image and move it to the spot you want to have it.
  In order to alter the size of the detail image you first select the detail image. Then pull one of the selection markers while keeping the left mouse button depressed.
- ► The zoom level of the detail image will change according to the size of the image object. The image segment being shown remains unchanged. The auxiliary lines are automatically altered to fit the (new) position of the image segment/detail image.

6) Now it's time to alter the size and position of the image segment.
   - Select the red frame delineating the image segment. You can alter its size and position within the image any way you like.
   - ► After every alteration to the image segment, the detail image will be changed accordingly. The position of the detail image is not affected by this.

A zoomed image detail (called 'Detail Zoom') is comprised of the image segment, the image detail and two auxiliary lines.



7) Now you format the zoomed detail.
   - Select the detail image and click the Properties button in the Report Objects button bar. You'll find all properties for image objects for the detail image in the Properties tab. All zoom levels and automatic labelling are available.
   - Select the image segment and click the Properties button. You can set color, line type and width in the Line tab.
   - Select one of the auxiliary lines and click the Properties button. You can set color, line type and width in the Line tab.

Record objects

Background information

Image database An image database enables a structured storing of all your images. It enables you to access a great number of images - fast and easy.

Database fields Database fields determine the structure of your database. Database fields define the criteria relevant to all information you wish to save along with the images. Database-field entries provide an unambiguous characterization of each image, which allows you to locate each image in the database.

Related Topics
Archiving Images

Predefined fields Predefined fields are fields prescribed by your image analysis program. They contain image-data information that your image analysis program can automatically read out, e. g., image calibration. The predefined fields of each image database are the same. If you only use predefined fields in your reports, you will not have to adapt the record objects of your report to your database.

User-defined fields Set up your own user-defined fields for each image database: e. g., "user", "project", "comment" or "instrument". These fields are usually different for each image database. Record objects (that refer to user-defined fields) can thus only match one particular image database.

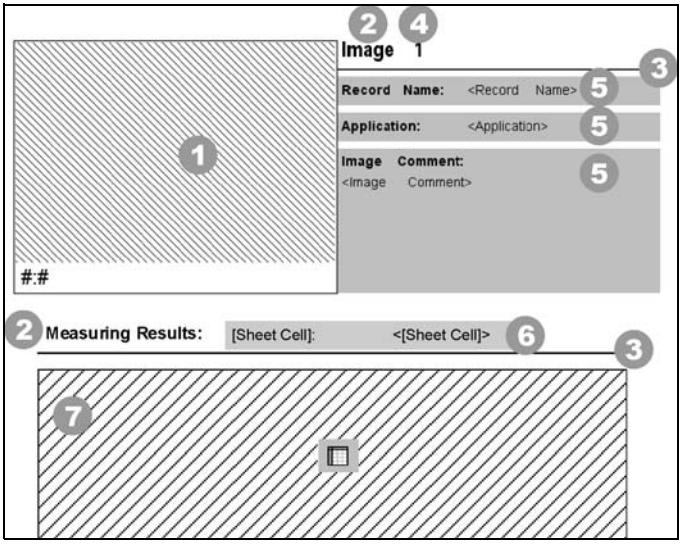
Record object You can insert images directly from an image database into a record object. When inserting the image into the record object, all image entries belonging to an image can be automatically included in the report. Use record objects to have report creation based on existing image databases largely automated.

Database images from the image manager Your image analysis program recognizes whether or not an image in the image manager has been loaded from an image database. You can insert this image directly from the image manager to a report whereby all of the database fields are correctly filled in. Use this possibility to edit an image before inserting an image for better print results. For example, you can correct a tinge or conduct a sharpen filter on the image.

What make up record objects? Record objects are complex report objects comprised of several separate component objects. Record objects usually consist of at least one image object and several field objects. You can, however, make use of all other kinds of report objects within record objects: text, AutoText, images and graphic elements. Placeholders for text and more images are not permissible. Sheets and diagrams in contrast serve as placeholders for documents which are stored below an image within the database.

Related Topics
Inserting sheets 192
Inserting diagrams 197

Record-object structure (see sheet on facing page): field objects (5) can only be used within record objects. They are usually comprised of the field name and field entry. Variously formatted templates for field objects can be defined in a report template.



	Type	Function	Remarks
1	image object	placeholder for database images	All image properties described above apply to image objects as well, i. e., you insert images at varying magnifications either as links or copies into a record object.
2	text	standard text to be printed along with every image	Texts are usually used in record objects to supplement the standard AutoTexts, e. g., the sequential number is supplemented with the word "image".
3	graphic object	lines	
4	AutoText	sequential image numeration	This type of AutoText is only available within a record object.
5	field objects	automatic printing of single-line contents of database fields	Field objects are composite objects that are generally (at least) comprised of the name of the field and the field's entry.
		automatic printing of Memo database fields (multi-line)	
6	sheet cell	placeholder for a special value from a sheet cell	Many special Add-Ins deliver standardized measurement sheets which are always constructed the same way. Insert the sheet below an image in the database. Use this field function to acquire individual measurement results, i.e., the G-value of a grain size analysis, into the record object.
7	sheet, diagram or graph	placeholder for a sheet, a diagram, or a graph	Sheets, diagrams, or graphs which are stored below an image in a database can automatically be inserted into a report. To do so, create record objects with placeholders, i.e., for a sheet.

Field objects

Field objects are fields of text linked to the content of a specific database field. They refer to a particular image database (which must be open when creating a report). Field objects are usually comprised of the name of the database field - the field name - and of the field entry itself. They can, however, also include all other kinds of report objects - excepting placeholders. Field objects can only be inserted within a record object.

Edit field objects

You can only begin to edit field objects once you have clicked on the Edit Object Template button (in the edit-object mode), moving you down a level within the edit-object mode.

What make up field objects?

Field objects can, in essence, include all kinds of report objects. Normally, field objects contain at least the name and content of the database field.

Your image analysis program does not automatically adjust the length of the text object to fit the field entries or database fields. When a field entry is longer than the text object, the field entry will be cut off on the right-hand side. You should thus keep an eye on how long your text objects are. Decide their length depending on how long the longest field entry or database field can be.

Three differently-formatted field objects illustrate the variety with which field objects can appear in a report.

Available field object components

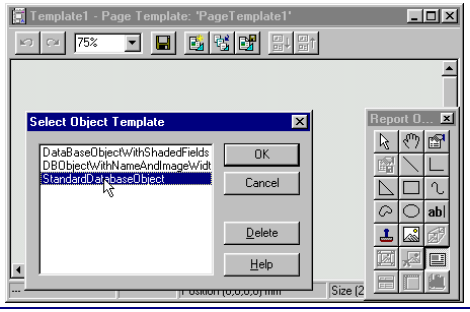
	Object	Function	Remarks
1	text variable	placeholder for the name of the database field	The field name is dictated by the definition of the fields in the database. When you insert a field object, the contents of this object will be automatically replaced with the field name selected. You can replace the field name by a definite text. To do so, doubleclick the field object in the edit-object mode. The field name can be edited in the Record Fields tab.
2	text variable	placeholder for the contents of the respective database field, i. e., the field entry This text variable appears in square brackets. When the field object is inserted, the field name appears here.	The contents of the database field is different for each image and is automatically filled out anytime a record object is inserted into a report from an image database. The <Calibration Unit> field entry will be replaced by, e. g., "mm" if the image has been calibrated in mm/pixel.
			You can format this text object just like any other. Of especial note is that you can permit multiline text, thus allowing space for database fields such as the "Memo" type.
3	graphic object	layout function such as frames and rectangles for use as colored highlighting for text	
4	image object	layout function, e. g., pictograms representing the various database fields	An image object defined in a field object cannot be used later on as a placeholder for images. You cannot insert a new image into this image object in this report.
			To save space, be sure that you always insert images as links. If you don't, images will be re-copied each time you insert a field object into a report.
5	field object	The template for a field object may include a field object (which must, however, refer to a particular database field: e. g., "Calibration unit"). You can then insert several database fields: e. g., "Height" and "Width" which will then always include the record object's unit of calibration.	
6	text	standard text to be printed with every database field	

Adapting record objects

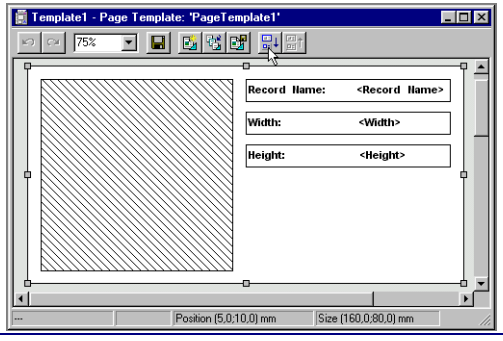
If you are using a database that does not have some of the fields that the record object does, then when you insert this kind of a record, these field objects will simply be ignored. You will not get an error message and the entry in the field object will remain unaffected.
This deals with placeholders for sheets, diagrams or diagrams. The placeholder remains empty if no sheet, diagram or graph is attached.

If you wish to use record objects, the record objects in the report template will have to be adjusted so that it fits your own database.

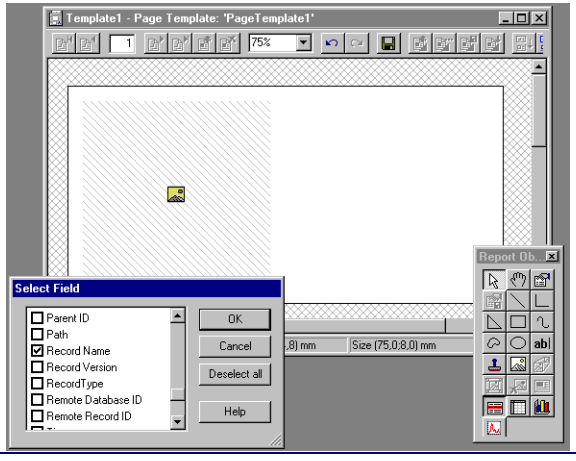
To be able to edit a record object, you have to insert an existing record object first. You can do this on any page you please.



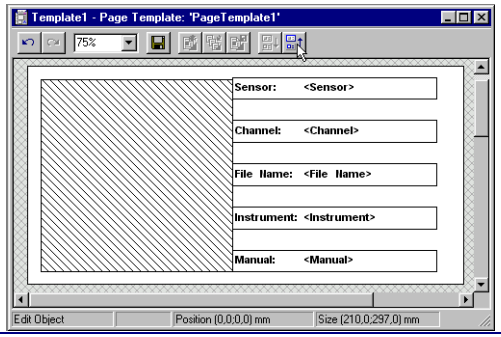
To alter a record object, select it (left-click). Then switch over to the edit-object mode by clicking on the Edit Object Template button. You can select the field objects individually in the edit-object mode and then delete them as needed.



Use the Field button in the button bar of the report window to insert new database field objects. You can select any of the database fields defined in the active image database.



To save an adjusted record object in the report template, simply close the edit-object mode by clicking on the Finish Object Editing button.



Object templates You can create your own templates for records and field objects. These templates determine what your record or field objects look like and their make-up. Object templates are saved under a separate name within the active document. You can then insert them into a report at any time. You define object templates within a report template generally so that you can use them with all the reports you create based on this template. It is not possible to import object templates from other report templates.

Step-by-step

Adding several images from one image database

1) Generate a new report based on the "Normal" template.
2) Open an image database of your choice.
3) Arrange your report and database windows such that they're next to each other, but not overlapping.
   - To do so, use the Window > Document-Manager... command. Keep the [Ctrl] key depressed and select the Database and Report documents. Click the Tile Vertical button and close the document manager.

4) Insert at least one record object. To do so, click the Record button located in the Report Objects button bar.
   - ► The mouse cursor will change its shape. Click on the approximate spot where you want to have the record object placed in the report. The position you click on represents the center of the record object. You can position the record object after editing.
   - ► The Select Object Template list will be opened. This is where you find all the record objects currently defined in the current report template. If the report template only has one, or no format at all for record objects, the record object will automatically be inserted in a standard format.
   - ► The predefined standard record object only contains predefined fields which exist in every image database. The content of these fields will be automatically included in the report.

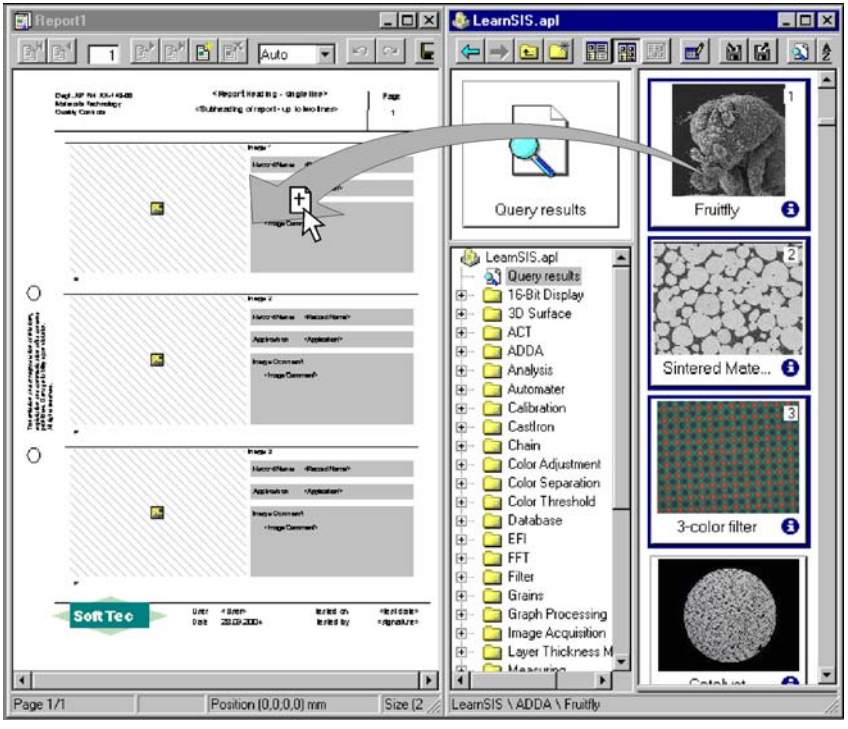
5) Now select several thumbnails in the database. You do this by keeping the [Ctrl] key depressed and selecting the various images via leftclick.

6) Drag the thumbnails from the database window directly on the first database object located on the report page.

Related Topics
Object templates 202

- ► If the number of records selected is greater than the number of record objects, your image analysis program will automatically add the necessary number of pages.
- ► Images are always added in the order in which they were selected in the database window.

This is how to insert records from a database directly into a report: select all database records you wish to include in the report. Drag the images selected - keeping the left mouse button depressed - onto the first record object within the report window. The records in the illustration have been selected as thumbnails.



Adapting record objects to your own database

Your image database generally contains fields that differ from the sample templates included. You have defined, e. g., the 'Material' or 'Order number' field in the database and in this case you want to have this information included with each image. In this case, you'll have to adapt the record objects to your database.
Adapting record objects to your own database is usually carried out by a report template. Only then are newly-defined record objects which are based on this template available.

1) Select the File > Report > New... command.
2) Select the "Normal" report template in the General tab. Select the Template option in the Create new group.
3) Confirm by clicking OK.
   - ► Your image analysis program creates a new report template. The header of the window displays the name of the new report template - "Template1" - and the name of the active page template, "3 image page".
4) Open the image database containing the fields you wish to make use of for future standard reports.
5) Use the Record button in the Report Objects button bar to insert an existing record object.

- ► The inserted record object has already been selected.

6) Click the Edit Object Template in the report window button bar to switch over to the edit-object mode.
   - ► The edit-object mode is where you can select and edit the separate elements of the record objects selected. Any other objects defined on the page are displayed with a crosshatching pattern only, for reference purposes.
7) Select all field objects that you wish to replace with your own field objects (select and [Del]). Delete, e. g., the "Application" and "Image Comment".

8) Click the Field button in the Report Objects button bar to add a new field object to the record.
   - ► The Select Field dialog box will be opened. This is where you'll find all database fields that are defined in the active image database.
9) Select the check box in front of the desired database fields and confirm with OK.
   - ► The mouse pointer will change its shape. Click on the spot approximately where you wish to have the field objects placed. Once the field objects have been inserted, you can position them more precisely.
   - ► The Select Object Template dialog box will be opened. This is where you select a template for a field object. Should your report template contain a single format for field objects, or not, the field object will be automatically inserted in a standard format.
   - ► All selected fields are inserted in the record object underneath one another.

10) Click the Finish Object Editing button in the report window button bar to save the altered record object.
11) Enter a name for the altered record object into the Finish Object Editing dialog box and click the Save Object Template button to terminate adaptation of the record object to your database.

12) Use the File > Report > New... command to save the report templates under another name.
13) Use the File > Report > New... command to produce reports based on the newly-adapted report template. Your own report templates will now be included in the User Templates tab in the New Report dialog box.
14) Now insert an image from the database into the adapted record object.
    - ► The image and the desired field entries as well, will be included in the report.

Text objects

Background information

Text objects You cannot enter text into a report directly. Before you can insert text, you have to reserve space for it. The area reserved for text is defined by a "text object". Text formatting is determined by the text object's properties. If you, e. g., use different font sizes in your report, you have to define a separate text object for each different text format.

Text-entry mode When in text-entry mode, the pointer is positioned within a text object allowing you to insert text. The text-entry mode is active directly after a text object has been inserted. If you want to edit texts in already existing text objects, doubleclick the text object us-

ing the left mouse key.
Doubleclicking does not put you in the text-entry mode, but instead opens the dialog box for text properties. The Text tab also allows you to enter or edit text.
Left click on an arbitrary position outside of the text object, in order to end the text-entry mode and to switch to layout mode.

Warning
The text may have a somewhat different format in the text-entry mode than in the actual report!

Layout mode
You can only edit the text object in the layout mode - not the text itself. You can alter the size of the text object by "pulling" at the selection markers. If you alter the size of a text object, you are thus altering the size of the text object - not of the actual text. Font type and size are not affected. Multi-line text automatically fits itself to the altered size of the text object.

Text flow
When in the text-entry mode you can enter as many lines of text as you like. The only lines that remain visible are those that fit within the text object. All the lines that do not fit within the text object remain hidden from view. This non-visible text remains however existent - it is simply not shown onscreen. You then need to enlarge the text object correspondingly. This is why text cannot be any longer than a page.

Insertion of text objects
Click this button (in the Report Objects button bar) to insert a text object. A new text object automatically contains the word "text".
Keeping the left mouse button depressed, draw a rectangle by moving the mouse. The area of the rectangle represents the space reserved for text within the report. Release the left mouse button to have the text object inserted into the document.

Text properties
Click the Properties button in the Report Objects button bar to format the text. You can also select several text objects and alter all their properties at the same time.

- Text color is a font property. You can set it in the Font tab.
- Background color is set in the Fill tab. The background is the entire area defined by the text object.
- Use the Line tab to set the frame's properties (its width and color).

Warning
You always determine the properties for the whole text within a text object. This is why individual words cannot be put in bold or italics. If this is what you want, then you'll have to compose the expressions using separate text objects.

Grouping text objects
Select and group several text objects so that you can alter font properties (type, size and color), background color and text frame for all the text objects simultaneously.

Aligning texts
When you wish to align text objects using the functions of the Align button bar, the vertical alignment of all the text objects being aligned should be the same. The reason for this is that all the functions are for the text objects, not the texts themselves. If you want to align text within the text frame, then go to the Text tab in the text properties.

AutoTexts

AutoTexts are a specific kind of text objects whose contents are independently determined. You can use AutoTexts for reports and report templates.

Insert AutoTexts
Click this button in the Report Objects button bar to insert an AutoText. The Select AutoText dialog box offers you all of the available AutoTexts. For example, Insert the AutoText called "Page Number" to have report pages numbered. Your image analysis program will automatically fill in the correct page number when you, e. g., delete a page located before the current page.

AutoText properties can be altered - just like the properties of any other report object - in the Report Object Properties dialog box. In addition to the properties to which you can assign text objects, you will find the AutoText tab where you can decide the type (of AutoText), and the way AutoTexts are updated.

Text variables

In order to change a text object to a text variable, you have to alter its name in the General tab. This tab is located in the text-object properties. The name of a text variable has to start with the symbol '@'.

Anytime you alter the contents of a text variable, your image analysis program will automatically update all other text variables in the report of the same name. You can change the contents of a text variable as often as you like; in order to, e. g., correct spelling errors.

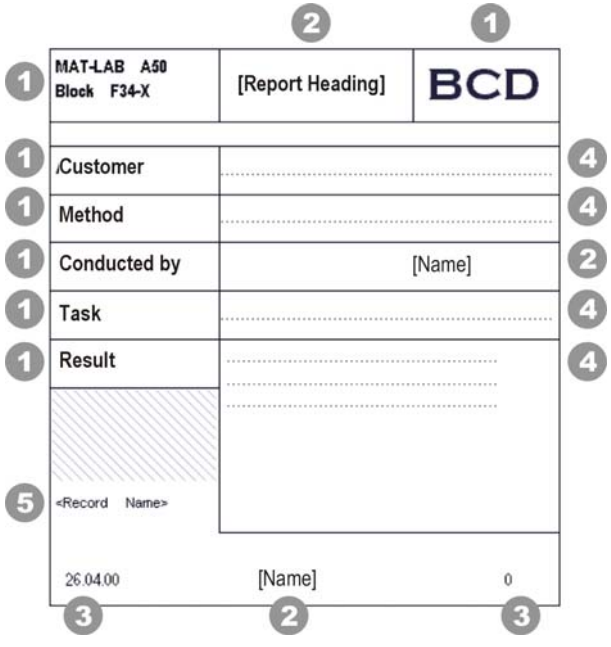
Text variables are usually defined in a report template so you can structure headers and footers. This means you only have to enter a heading - that is to appear on every report page - once. You can define as many text variables as you like in your report templates; e. g., for headings, author, project title, department.
You can, however, also define text variables on a report page within a report.

Different page templates

When you change the contents of a text variable within a report, this changes the contents of all the report pages containing this text variable. It does not matter whether the report pages are based on the same or different page templates. A text variable can also appear on the same page more than once.

Formatting text variables

Text variables are only linked as far as content is concerned and not with regard to the formatting. This means that just because you alter the formatting of a text variable does not automatically mean that the other text variables of the same type will be updated in the report.



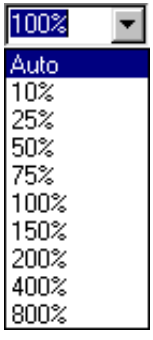
The report (above) contains various kinds of text. These are described in the sheet below. Texts that are text variables appear in square brackets. Editable text objects have dotted lines within them as they are to be filled out (with text). Field objects that are automatically filled out when you insert a record object are put in square bracket.

	Type of text	Particular properties	Insertion
		Report Object Properties dialog box	Report Objects button bar
1	Background text	The Background Object check box (Select and Move tab) has been selected.	in report template only
2	Text variable	The text object's name (in the General tab) starts with an "@" symbol.	
3	AutoText	On the General tab, the text object receives the type AutoText. The Report Object Properties dialog box now includes an additional tab: AutoText.	
4	Editable text object	The Background Object check box (Select and Move tab) has not been selected.	NOT in a record or field object
5	Field object	On the General tab, the text object receives the type AutoText.	only available in edit-object mode

Step-by-step

Inserting text objects

1) Enlarge the display of a report page so that the text is legible. Select an appropriate zoom factor from the Set Zoom list in the button bar of the report window, e. g., 100%, or enter the desired zoom factor directly.



2) Click the Text button in the Report Objects button bar to insert a new text object into the report.
   - ► The mouse cursor will change shape and appear as a cross-shaped symbol.
3) Now define a rectangular area where you plan on inserting the text. The text has to appear within the area you have defined to be displayed and printed out.
   - ► The new text object has now been selected and the word "Text" will appear within it.

4) Click the Properties button in the Report Objects button bar to format the text within the text object.
5) Select the font and font size in the Font tab. Select the "Italic" format for the text. You can also decide on what color you want the text to be.
6) Click the Apply button to try out the text formats selected in the report.
7) Decide on what kind of text to use in the Text tab:
   - Select the Multiple Lines check box if the image comment is to have more than one line. The Word Break check box will now become available.

- Select the Word Break check box so that your image analysis program calculates wordwrap automatically. This is the only way you can be sure the text will automatically adjust to any changes you make to the size and position of the text object.
- Clear the Word Break check box if you, e. g., want to list single words one beneath the other. Now, if you need wordwrap, you'll have to explicitly set the wordwrap within the text object via the [Enter] key. Text format is now unrelated to the size of the text object.

8) Define a frame surrounding your text object in the Line tab.
   ► Clear the Transparent check box and determine line width and color. A number of line types are only available for the thinnest line width.

9) If you wish to have image comment highlighted in color, go to the Fill tab to define a highlighting color.
   ► Clear the Transparent Fill check box and determine the highlighting color via the Foreground Color button.

10) Click OK to close the dialog box.

Inserting sheets

Background information

Sheets Click this button in the Report Objects button bar to insert a sheet into a report.
If there are any sheets open during insertion, you will be informed via picklist about the open sheets. Select the sheet which you would like to insert from the list. If there are no open sheets, insert a placeholder for the sheets.
The sheet object you insert when working in a report template, in order to reserve space for a sheet, is always empty.

Properties of sheet objects

- **Selecting sheet cells:** your image analysis program will insert precisely those sheet cells (of the measurement sheet) that are visible within the sheet window. This means you can alter the size of the window to clip lines and/or columns. Empty sheet cells are ignored at insertion. You can make use of the autofilter functions located in the Edit menu in order to have specific kinds of data not shown. Any filter you have set will be considered upon insertion into the report. When moving a sheet from a database to a sheet object, only the sheet cells are inserted which were displayed during the insertion of the sheet! If you explicitly want to determine exactly the sheet cells which are to be inserted into a sheet, define a sheet object within the record object.
- **Formatting sheets**: a template cannot be defined for a sheet. Each sheet you insert has to be formatted individually.
- **Sheet object structure**: your image analysis program converts measurement sheets (before insertion into a report) into a complex object made up of numerous separate text objects. Every single sheet cell is, in fact, a separate text object. You can completely disassemble a sheet into its component parts in a report for editing purposes.
- **Editing sheets**: to be able to edit each sheet cell separately you have to break up the grouping ('ungroup'). Regroup each sheet after you have finished editing. You can work with the sheet more easily when it is grouped. A sheet that has been grouped together can be, e. g., positioned as a single object.

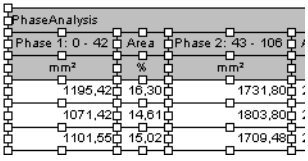
Sheets in record objects Use sheets in record objects, if you want to insert additional information from an image database together with a sheet. A sheet which has been defined in a record object, has an additional tab located in the sheet properties. The Document Link tab enables you to exactly define the sheet cells which are to be inserted into the report.

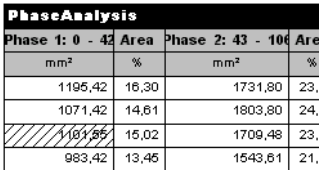
Unlike the sheet objects which are directly inserted into the report, the acquired sheet cells are independent of the window size of the sheet.
Use this possibility if your measurement results are always written to a sheet in the same form, in order to determine the sheet cells which are relevant for you.

Sheet cells as field objects

Many special Add-Ins deliver standardized measurement sheets which are always constructed the same way. Use a special field function to acquire individual measurement results, i.e., the G-value of a grain size analysis, into the record object. The [Sheet Cell] field is automatically included in the list of database fields. This field has additional object properties. You can exactly specify the desired sheet cell in the Record Fields tab.

A sheet is a group of individual text objects. Therefore, you can change the appearance of a sheet from sheet cell to sheet cell.





Step-by-step

Insert and edit open sheets directly into a report

1) Load the sheet you want to insert into a report. For example, use the Measure > Histogram... command to create a sheet .
2) Now maximize the sheet window (to do so, click the middle button in the upper-right corner of the sheet - in the document header). This will enable you to have the greatest number of sheet cells inserted into the report.
3) Activate the report window. Select, e. g., the report name located at the bottom of the Window menu in the list of files.

4) Select the image object and click the Sheet button located in the Report Objects button bar and pull open the sheet object.
   - ► Should you have loaded numerous sheets, the Available Sheets dialog box opens. Select the desired sheet and confirm via OK.
   - ► Your image analysis program will insert all lines and columns of the measurement sheet into the report that are visible within the sheet window. Cells that are without content will be left out.

5) Click the Ungroup button in the Order and Group button bar to be able to edit the sheet within the report.
   - ► What to do if the button bar is not available:
     Use the Special > Edit Button Bars... command. To have a button bar displayed select the check box next to the name of that button bar.
   - ► A sheet that is inserted into a report is comprised of a group of text objects. The grouping that had kept the individual cells together will now be taken apart. You will thus now see the marking symbols around each separate text object.
   - ► You can now, e. g., rename the sheet or the columns, add a comment on individual measurement values, or have certain cells of the sheet highlighted in color.
6) As needed, you can edit the sheet. Doubleclick, e. g., on the sheet header to rename the sheet.

7) Once editing is completed, you select all the sheet elements by drawing a frame around the whole sheet - keeping the left mouse button depressed.

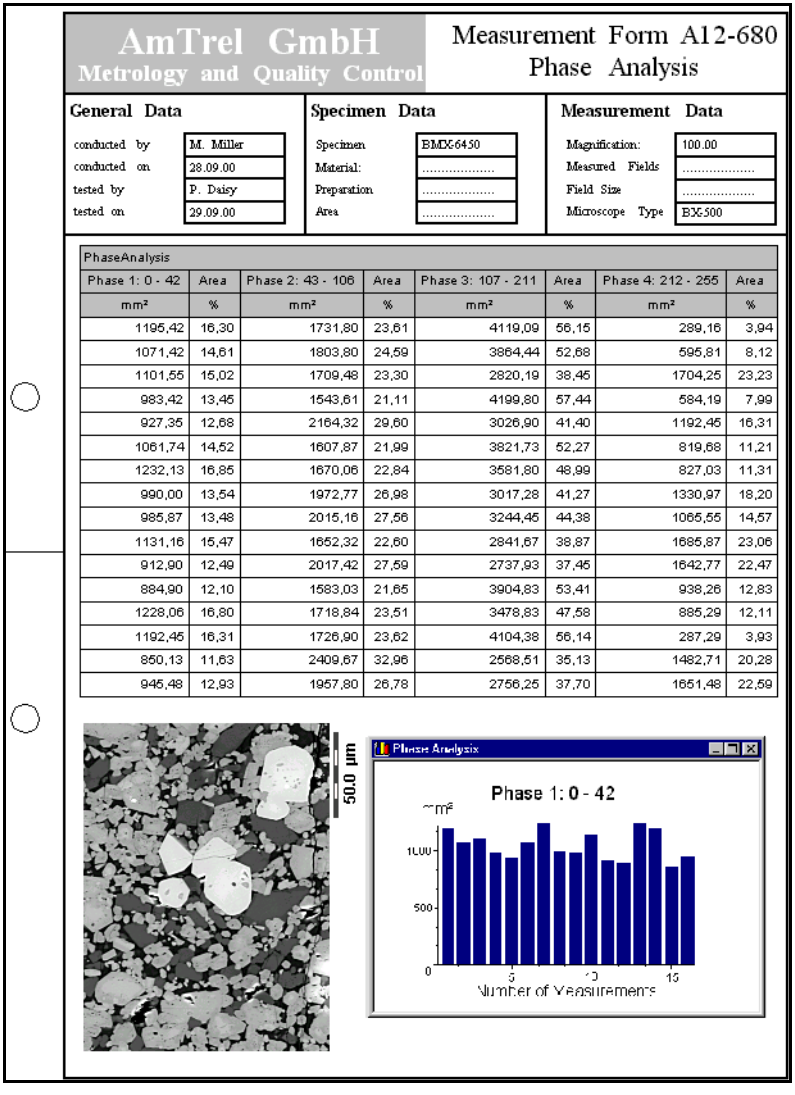
8) Click the Group button in the Order and Group button bar to have the separate sheet cells reassembled into a single object.

9) Position the sheet keeping the left mouse button depressed and, if necessary, adjust sheet size. Adjust sheet size by moving one of the sheet edges with the mouse, keeping the left mouse button depressed.

10) You now change the size of the sheet. To do this, you keep the [Ctrl] key depressed so that the sheet remains in the same position.
    - ► When adjusting the size of a sheet the font and font size remain unchanged. The separate values will thus be pushed closer together, and in extreme cases overlapping.

11) Click the Properties button in the Report Objects button bar to have the sheet formatted. At the same time, you alter the properties for all sheet cells.

You can automatically fill an entire report with database information.



AmTrel GmbH
Metrology and Quality Control

Measurement Form A12-680
Phase Analysis

General Data

conducted by	M. Miller
conducted on	28.09.00
tested by	P. Daisy
tested on	29.09.00

Specimen Data

Specimen	BMX-6450
Material:	.....
Preparation	.....
Area	.....

Measurement Data

Magnification:	100.00
Measured Fields	.....
Field Size	.....
Microscope Type	BX-500

PhaseAnalysis

Phase 1: 0 - 42	Area	Phase 2: 43 - 106	Area	Phase 3: 107 - 211	Area	Phase 4: 212 - 255	Area
mm²	%	mm²	%	mm²	%	mm²	%
1195,42	16,30	1731,80	23,61	4119,09	56,15	289,16	3,94
1071,42	14,61	1803,80	24,59	3864,44	52,68	595,81	8,12
1101,55	15,02	1709,48	23,30	2820,19	38,45	1704,25	23,23
983,42	13,45	1543,61	21,11	4199,80	57,44	584,19	7,99
927,35	12,68	2164,32	29,60	3026,90	41,40	1192,45	16,31
1061,74	14,52	1607,87	21,99	3821,73	52,27	819,68	11,21
1232,13	16,85	1670,06	22,84	3581,80	48,99	827,03	11,31
990,00	13,54	1972,77	26,98	3017,28	41,27	1330,97	18,20
985,87	13,48	2015,16	27,56	3244,45	44,38	1065,55	14,57
1131,16	15,47	1652,32	22,60	2841,67	38,87	1685,87	23,06
912,90	12,49	2017,42	27,59	2737,93	37,45	1642,77	22,47
884,90	12,10	1583,03	21,65	3904,83	53,41	938,26	12,83
1228,06	16,80	1718,84	23,51	3478,83	47,58	885,29	12,11
1192,45	16,31	1726,90	23,62	4104,38	56,14	287,29	3,93
850,13	11,63	2409,67	32,96	2568,51	35,13	1482,71	20,28
945,48	12,93	1957,80	26,78	2756,25	37,70	1651,48	22,59

Inserting sheets into an empty sheet object

1) Close all loaded sheets. Simply use the Window > Close All command to do so.
2) Generate a new report based on the "Normal" template.
3) Select the image object and click the Sheet button located in the Report Objects button bar and pull open the sheet object.
4) Load the sheet you want to insert into a report.
5) Select the sheet object on the report page and click the right mouse button.
6) Select the Select Sheet... command from the context menu to open a list of all the sheets loaded and to insert the desired sheet.

Using sheets in a record object

1) Open an image database and insert a sheet.
2) Generate a new report based on the "Normal" template.
3) Use the Record button in the Report Objects button bar to insert an existing record object.
4) Click the Edit Object Template in the report window button bar to switch over to the edit-object mode.
5) Select the image object and click the Sheet button located in the Report Objects button bar and pull open the sheet object.
6) Click the Properties button in the Report Objects button bar.
7) In the Document Link tab enter the Filename " *.* " into the field in order to insert the first attached sheet together with the record.
   Determine the number of rows and columns which are to be inserted into the report. The heading of a measurement sheet usually has the sheet cell number 0.
   Please note: If you use 0 as the amount of rows or columns, your image analysis program inserts exactly that part of the sheet which was active during the insertion of the sheets into the database.
8) Click OK to close the dialog box.
9) Click the Finish Object Editing button in the report window button bar to exit the edit-object mode.
10) Now insert the sheet from the database into the adapted record object. To do so, you can either move the sheet or also the record under which the sheet has been inserted, onto the record object.
    - ► The sheet and the desired field entries as well, will be included in the report.

Using sheet cells in a record object

1) Use the Record button in the Report Objects button bar to insert an existing record object.
2) Click the Edit Object Template in the report window button bar to switch over to the edit-object mode.
3) Click the Field button in the Report Objects button bar to add a new field object to the record.
4) In the Select Field dialog box, select the [Sheet Cell] entry and confirm with OK.
5) Click the Properties button in the Report Objects button bar.
6) In the Record Fields tab, enter a description of the measurement value into the Fieldname field, i.e., G-Value.
7) In the Sheet group enter the Filename " *.* " into the field in order to insert the first attached sheet together with the record.
8) Determine the desired sheet cell in the Sheet and Column field. Should the inserted sheet not contain the specified sheet cell, the field remains empty.
9) Click OK to close the dialog box.
10) Click the Finish Object Editing button bar located in the report window.
11) In the Finish Object Editing dialog box click the Exit without Save button.

12) Pull a record with a sheet from the database onto the altered record object.

Inserting diagrams

Background information

Diagrams Click this button (in the Report Objects button bar) to insert a diagram into a report. "Diagrams" can only be internal graphics. Some commands, e. g., Histogram... automatically generate diagrams. Otherwise, you use the Edit > Diagram > New... command for a graphical display of values from a measurement sheet.

Diagram properties

- Diagrams, like sheets, can also be used as placeholders.
- When enlarging diagrams the font size is correspondingly enlarged as well. This is not the case with text objects or sheets. Keep the [Shift] key depressed while adjusting diagram size. This ensures that the length/width ratio of the page remains the same and the lettering will not be distorted.
- Diagrams cannot be rotated. The buttons in the Rotate button bar are not available.
- To alter the background color of the diagram, go to the Fill tab. Text labels have nothing to do with this and remain black lettering on white.
- Determine the color and the width of the frame outline in the Line tab. The line width of the axes is preset and cannot be altered.

Metafile format WMF stands for "Windows Metafile Format"; a format used for data exchange between Windows applications.
(Diagrams are inserted as Windows Metafiles). After the RTF Export has been completed, you can edit them in MS Word. You can also, e. g., alter font and font size within diagrams in Word. Please note that font and font size may be altered simply by your opening the metafile in the graphic editing mode of Word.

Report templates

Creating / saving new templates

Background information

Report templates Report templates are a kind of report file in which you determine what your future reports are to look like. Each report you create using report generator is based on a report template.

Component parts of a report template A report template consists of page templates and object templates. These are generated within a particular report template and are not available for use in other report templates. You cannot import page or object templates from other report templates. You can, of course, modify existing report templates and save them under a different name. This way you can use all previously-defined templates for your ‘new’ report template.

What are report templates for? Report templates determine what the reports based on them look like. Defining report templates is thus of quintessential importance as far as creating your own reports is concerned. The work you invest initially creating a well-thought-out report template will pay off. You’ll save time when you get down to actually creating reports with that template.

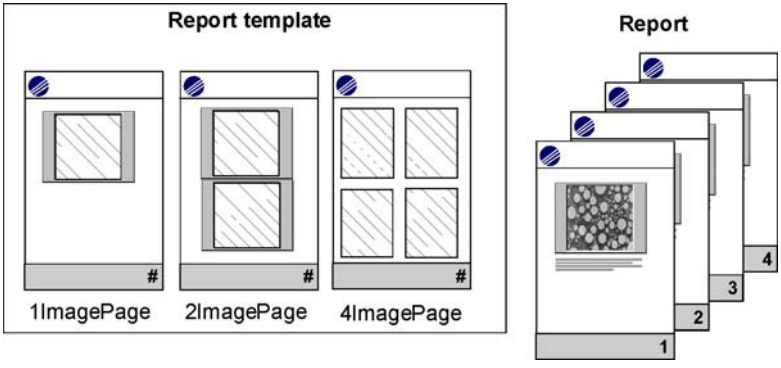
Altering existing report templates

If you alter a report template, these alterations only affect reports you create subsequently. Existing reports based on the (now altered) template cannot be automatically updated.

Altering templates within reports

You can also alter or redefine page and object templates within a report. These templates are then, however, only available within that report and not for other reports that you create based on the unaltered report template.

The report template (left) contains three different page layouts in the example. The report (right) consists of four successive pages. The "1ImagePage" is the only page template that was used of those available within the template.

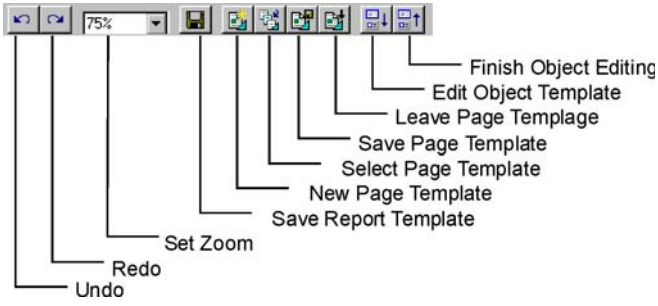


The following sheet lists the differences between the reports and the report templates:

	Reports	Report templates
Structure	A report consists of multiple successive pages. All report pages can be - but don't have to be - based on a single page layout. The "1ImagePage" page template defines what all report pages look like in the example shown.	A report template consists of multiple pages with different appearances and functions: e. g., a cover page and a page for 1, 2 or 4 images. Besides these page layouts, report templates can also have object templates for record and field objects.
Document window's background	white	gray
Status bar	The first field of the status bar indicates the current page number/total number of existent report pages.	The first field of the status bar is blank.
Header	The header of the report window shows the name of the report. If the report has not been saved yet, it will have a standard name (which is "Report" + consecutive number).	The header of the template window shows the name of the report template along with the name of the active page template.
File format	Report container (*.src) Report (*.srd)	Template container (*.stc) Report template (*.srt)

Report template button bar

The Report Template button bar is a part of the report window. It differentiates itself in some functions from the button bar used for creating reports. Please keep in mind that these buttons' functions are not available as menu functions. This is why this button bar should remain visible. If you like, you can use the Special > Edit Button Bars... command to show or hide the button bar or to add other frequently-used buttons.



Background objects

Page templates can include background objects. Background objects that have been defined for a page template will appear on each report page created based on that page template.
Background objects cannot be edited on a report page. This is why you cannot select them on a report page.
Text objects and all graphic objects are automatically inserted as a background object in a template. Image objects, sheet objects, diagram objects and graph objects, by default, are not background objects.

Definition
Select one or more objects on a template page. Open the dialog box on object properties. Objects you have selected can be changed to background objects in the Select and Move tab.

Background image objects
If you do use an image object as a background object then you should always insert the image as a link. Otherwise the image will be resaved for each newly created report.

Altering background objects within a report
Use the Edit Page Template button to alter page templates within a report. Any changes made to background objects will immediately affect all currently existing report pages. Any changes you make to objects that are not background objects will only affect newly-created report pages.

Page templates

The separate pages of a report template are called "page templates". They're used to define page layouts that you can use later on in a report. Each page layout is saved under a separate name in the report template. When you subsequently create a report based on that report template, you can select a page template from the list for each report page.

The "empty" page template is a standard component of every report template. Please note that it is not possible to define objects on this "empty" page template. After saving the report template, your image analysis program will delete this page template. You can, however, make good use of this page for editing record objects because there are no other report objects that could interfere with your editing.

When you are creating an object template or a page layout, begin by inserting the elements that are to appear in the background, e. g., a frame. Every object you subsequently insert will thus automatically be in the foreground.

Altering page templates
Any and all alterations you make to a page layout have to be re-conducted on each individual page of a report template. Make use of the Select Page Template button in the Report Template button bar to edit individual template pages.

Determining the first page of a report
Open the report template and click the Select Page Template button. Then select one of the page templates listed for use as a cover page, or first page of your report. Now save your report and close the report window once the cover page has been activat-

ed.
When you then create a new report based on this report template, the first page of the report to be opened will be this one.

Inserting new page templates

There are two ways to insert new page templates within a report template.

- Click the New Page Template button to insert a blank page template into the report template. A blank page template will be automatically created and given a standard name: "page template + consecutive number". Click the Save Page Template button to alter the standard name.
- Base your new page template on an existing one. To do this, you first click the Select Page Template button and save the page template - via the Save Page Template button - under a different name.

Deleting page templates

In order to delete a page template from a report template, open the report template and have the list of current page templates displayed. The Delete button is located in the Select Page Template dialog box.

Editing page templates within a report

Page templates are defined within report templates. You can, however, also create new page templates within a report, or, alter existing ones. To do this, simply click the buttons of the Report button bar shown on the left.
Please note that any changes you make to a page template within a report only apply to that report. The report template that the report is based on remains unaffected. The next time you create a report using this report template you'll have the same, unchanged page templates.

Step-by-step

Creating a new report template

You can only create a new report template based on an existing report template. If you haven't created any of your own report templates yet then go to the General tab where you'll find predefined report templates that are included in the installation and which you can modify for your own purposes.

1) Select the File > Report > New... command.
   ► The New Report dialog box offers you all report templates that are located in the current report, user template and workgroup template directories.
2) Select the report template in the New Report dialog box you wish to base your new report template on.

Warning

3) Select the Template option in the Create new group.
   Only via this step, can you decide that you want to create a report template and **not** a report.
4) Confirm via OK to create the new report template.
   ► You can always edit only one report or report template at a time. This means that if you still have a report or report template that is open, you'll be asked whether you'd like to save any changes made or not.
   ► The report currently open will be closed and the first page of the report template will be loaded into the Report window.
   ► The Graphical User Interface (GUI) for editing report templates is somewhat different than the one used for creating and editing reports. You'll know that you are editing a report template and not a report because the background is gray.

Adding a new page template for several images

You wish to add a new template page that is to contain 6 images.

1) Click the Select Page Template button in the report window button bar to open a list of all template pages defined in the current report template.
2) Select a page template you can base your new page on and confirm via OK. Try to use a template page as the basis for a new page layout, which already contains all of the important standard elements of a report page.
   ► The report window will now display the template page selected.

3) Click the Image button in the Report Objects button bar to define a new image object within the template page.
4) Now you define a rectangular segment for the image object. Define its exact size and position via mouse or in the Position and Size tab.
5) Drag a representative image from the image manager or from an image database and drop it on one of the image objects to better be able to assess how the images will look in later reports.

6) Select the image object and click the Properties button in the Report Objects button bar to determine the properties of the image object.
7) Check the settings in the Select and Move tab.
   - Clear the Background object check box to define the image object as an image placeholder. Objects that you define as background objects cannot be edited later on in the report.
   - Select the Fixed Position check box to establish a fixed size and position of an image object for all reports. These cannot be altered later on in a report.

8) Click the Clear Object button in the Report Objects button bar to remove the test image from the report object.
   ► The lettering of the scale (of length) and the values of the automatic zoom will be replaced by number symbols (#).
9) Copy the image object by pressing the [Ctrl] key each time you move the "new" image object to its intended position.

10) Click the Save Page Template button and enter a new name, e. g., "ImageGallery" into the field.
11) Confirm via OK to have the new template page added to the report template.
    ► The new template page, called "ImageGallery" will now also be available to you when you create a new report based on the current report template.

Saving report templates

1) Press [F8] to open the Preferences dialog box and select the Report tab.
   ► You'll find the standard path name for saving reports and report templates in the Directories group.
   ► Your image analysis program will propose the "Report" directory for saving report templates.
2) Enter the path name you want to be using for saving your templates into the User templates field.

   - If the report directory is not yet existent, click the ... button next to the User templates field. Click the Create New Folder button in the Select Directory dialog box to set up the directory.
3) Confirm the new template path via OK.

4) Click the Save button in the Standard or Report button bars.
   ► When you save a report template for the first time, the Save Report Template dialog box will be opened automatically. The preset path is the path you entered into the preferences in the Report tab for saving reports.
5) Enter a name for your report template that reflects its contents into the File name field.
6) Select the report template directory you determined in the Preferences dialog box, in the Save in list.

Warning

Your image analysis program will propose the current directory in the Save in list. Be sure that you save your report template in the correct directory. If the report template is saved in another directory it will not be offered in the New Report dialog box.

7) Click the Save button to save the report template.

8) If you wish to save the report template after having made changes, click the Save button to have the report template (in its previous form) overwritten by the most current version.

Object templates

Background information

Object templates

You can create your own templates for records and field objects. These templates determine what your record or field objects look like and their make-up. Object templates are saved under a separate name within the active document. You can then insert them into a report at any time. You define object templates within a report template generally so that you can use them with all the reports you create based on this template. It is not permissible to import object templates from other report templates.

Edit-object Mode

The edit-object mode is for selecting and editing the separate elements of a record object you have selected. All other report page elements are not available for editing and are only shown onscreen for reference purposes.
The edit-object mode is available within a report for editing individual record objects.

Field entries are not filled out in the edit mode when you drag an image from a database into the image object. This ensures that the labelling of the fields remains general when you insert a new record object.

Creating new object templates

A rule of thumb for all templates you generate within report generator: you can only generate a new template by editing an existing one. To generate a new object template for a record object you first insert a record object, edit it and save the template under a different name.

Object templates are listed alphabetically. Use this to your advantage and pick a name for object templates you frequently use that starts with a letter near the beginning of the alphabet.

Deleting object templates

You now edit an object template and then terminate the edit mode immediately. Select the object template from the object-template list (in the Finish Object Editing dialog box) and click the Delete Object Template button.
Once you have deleted all the templates on the list, your image analysis program will offer you a standard template as soon as you have inserted a new record object.

Standard object templates

If a report template does not contain any defined record objects, your image analysis program will add a standard record when you click the Record button. As soon as you have defined your own object template for record objects, the standard record will no longer be available. Therefore, if you wish to be able to use the standard record later on, then save it.

Text objects in object templates

Object templates cannot include editable text objects. If you wish to subsequently insert a record object into a report, you can only alter the texts within the text objects in the edit-object mode.

Step-by-step

Creating new field object templates

The object template is to include two field objects of varying format. One format is to indicate the magnification of each image. The other (differently-formatted) field objects are to contain information on the image database image.

1) Load the image database which contains the images for your report.

2) Select a record object and click the Edit Object Template button in the report window button bar to switch over to the edit mode for object templates.

3) Click the Field button in the Report Objects button bar to insert a standard field object into the record. You will be creating a new object template for field objects based on this field object.
   - You cannot insert field objects without an existing database. This is because without a database, no field information will be available! You will receive an error message if a database is not open.
   - ➤ The Select Field dialog box will be opened. This is where you'll find all database fields that are defined in the active image database.

4) Select any of the database fields and confirm via OK.
   - When defining an object template, you don't need to worry about selecting any particular database field. What you are doing now is simply defining the layout. You can then later on apply this layout to any database field you like.
   - ➤ No object templates have been defined for the "Normal" template, which means that the standard field object will be automatically inserted. If you have already defined object templates for fields, the Select Field dialog box will be opened.

5) Click the Edit Object Template button in the report window button bar to switch over to the object-template editing mode (in this case, for the field object).
   - Please note that you are already in the object-template editing mode. You can edit object templates in several multi-level steps: Now define a field object template.
   - ➤ You can now select the separate elements of the field object and then edit them.
   - ➤ All other objects, even those of the active record object will only be shown for reference purposes and thus appear crosshatched. These can no longer be selected.

6) Now you edit the field object.
   - The field name is an essential part of the field object. You can omit the field name when defining an object template for a field object, but you cannot replace it with a fixed text.

7) Click the Finish Object Editing button to save the object template for the field object.

8) Enter a relevant name for this field object into the Finish Object Editing dialog box and click the Save Object Template button.
   - ➤ This will return you to the record-object editing mode.

9) Click the Field button in the Report Objects button bar to insert field objects based on the object template you have just defined.

10) Click the Finish Object Editing button to save the now completed record object.

11) Use the Record button (in the Report Objects button bar) to insert the newly-defined record object onto a template page.

Planning report templates

Before creating a report template

1) **Using existing templates** If it's possible to make use of an existing report template then do it! Empty pages mean lots of work, as well as the fact that creating so many report elements is redundant.

2) **Defining your basic layout**: If possible, define all background objects of the report in advance.
Draft a basic layout including frame(s), company logo, an address space, and space for general information such as the department name and/or order number. If you have to make changes later on, you'll have to adjust each template page separately. Existing reports cannot be automatically altered to fit a new layout. This is why any 'avoidable' changes that you have to make later on (i. e., *after* creating the template), take up quite a bit of time.

Creating a report template involves...

1) **Finding a relevant name:** Give each of your page templates names relevant to their contents. This ensures that each user will have no trouble recognizing which page template is which when inserting a new report page(s).

2) **Labelling text placeholders**: A user should be able to immediately recognize (and without having to try out each blank space) which report-template text fields are to be filled out and which ones are background objects. You should thus label each text objects of a report (that is meant to be filled out by the user) right from the start in the report template. You can, e. g., place text variables within square brackets and write a request in text placeholders.
Do not define any text fields within your templates that contain no text. The user will have difficulty relocating these text fields within the templates.
You can't tell whether a text object is AutoText, background text, a text variable or editable text by simply looking at it. This is why it's a good idea to decide on some kind of indicator to help you more quickly distinguish between different types of text. If you have several users making use of the same templates, all of them should be able to tell which text objects have to be filled out, and which do not. You could use, e. g., square brackets to indicate text variables in your report templates. Editable text could be indicated by three dots or you can actually write a clear request within the text object: "Enter image comment here".

3) **Configuring the Graphical User Interface (GUI)**: Take the time to configure the Graphical User Interface optimally to your needs when working with report generator: define window width of the report window and of the database window such that both windows may appear at the same time. Position both windows so they do not overlap.
Place the button bars, which belong to the report generator, to the right or the left within the user interface - not below the standard button bar at the top. If the button bars are positioned below the standard button bar, the display of the whole Graphical User Interface will move up each time you switch documents.
If you are inserting images from only one database, then you can increase the

amount of space for report generator significantly by minimizing both the image manager and the Viewport manager while you edit a report. To minimize the one and then the other use the following keyboard shortcuts: [Alt + 1] and [Alt + 2].

4) **Reference Page**: Create reference pages for all elements that you use frequently in your report template. This could, e. g., be a group comprised of an image object, text object and lines. Text objects which can be edited cannot be defined within a record object. This is why you define a record object along with a text object on the reference page.
Define all the elements that can be copied faster than they can be created from scratch: e. g., graphic elements you have created on your own.

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